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AUTHOR Gash, Hugh
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ABSTRACT

This training study investigated the relation between class inclusion and role-taking in elementary school children. The objectives were: (1) to establish the asynchrony between class inclusion and role-taking on an Irish sample and a French sample of preoperational children, and (2) to investigate whether this asynchrony is merely a function of the difficulty of the measures used or whether a developmental sequence is entailed by the sequence. Subjects were 72 Irish 5- and 7-year-old children and 72 French 6- and 7-year-old children. Six tasks were used to measure class inclusion. Three cartoons, each of which was followed by two role-taking questions, were used to measure role-taking ability. Following pretesting, subjects were assigned to either a control group or one of two training groups, class-inclusion or role-taking training. Training procedures emphasized verbal inducement of conflict. Results indicated the following: First, a developmental asynchrony was confirmed in which class inclusion emerged prior to role-taking. Second, training in class inclusion and in role-taking significantly increased the skill trained as indicated on posttest scores. Third, training in role-taking, which was successful only with 7-year-olds, significantly increased class inclusion scores at this age level; successful training in class inclusion, however, did not increase role-taking significantly. It is concluded that the form of role-taking measured includes the mental operations necessary for class inclusion. (Author/SS)

Class Inclusion then Role-Taking, a Sequence?

Hugh Gash

Education Department, St. Patrick's College, Dublin 9, Ireland

Paper presented at the meeting of the Society for Research in Child Development, San Fransisco, March 1979.

ABSTRACT

Subjects were 72 Irish five and seven year old children and 72 French six and seven year old children. First, a developmental asynchrony was confirmed in which class inclusion emerged prior to a form of role-taking (Flavell, 1968 task 1D). Second, training in class inclusion and in role-taking significantly increased the skill trained in posttest as compared with pretest scores. Control groups established the stability of the measures used between pretest and posttest. Third, training in role-taking, which was only successful with seven year olds, significantly increased class inclusion scores at this age level; successful training in class inclusion, however, did not increase role-taking significantly. It is concluded that this form of role-taking includes the mental operations necessary for class inclusion.

Class inclusion then role-taking, a sequence?

Piagetian stage theory emphasizes the importance of interactions between cognitive structures necessary to the expression of similar but different conceptual abilities. Research on the intersection of emerging logical and social abilities during the concrete operational period is scant, and if one follows Wohlwill (1973), many of the studies of this intersection can be criticized because they have quantified variables better considered qualitative, and more importantly that the statistical techniques employed were more likely to conceal rather than reveal developmental asynchrony or synchrony (e.g., Feffer & Gourevitch, 1960; Hollos, 1975; Hollos & Cowan, 1973; Rubin, 1973; Sullivan & Hunt, 1967; Turnure, 1975). This present training study was designed to investigate the possibility that mediational linkage is entailed by the sequence found for class inclusion and a form of role-taking in earlier studies in the U.S. (Gash & Smock, in press) and in India (Behl & Gash, in press).

Cartoon-tasks were used to assess role-taking following Flavell (1968, task 1D). Subjects first described a cartoon sequence: Then they were asked how another would reconstruct the story if shown only part of the sequence. Egocentric responses were those in which information privileged to the subject was attributed to the'other'. Kurdek (1977) has recently argued that this is one form of task which requires that the subject coordinate the psychological status of both self and other. A priori, decentered responding requires (1) classification of cartoon content into (a) privileged meanings and (b) alternative meanings, and (2) coordination of such classifications in producing responses. Following this line of reasoning, it is the cognitive operations which coordinate, separate and combine

elements in thought which are what is common to class inclusion and this form of role-taking. These a priori analogies between class inclusion and role-taking led Gash (Note 1) to hypothesize that class inclusion would be developmentally prior to this form of role-taking, and Miller, Kessel, and Flavell (1970) had made the same argument earlier.

To explore the nature of the relation between class inclusion and role-taking, training experiences were provided in both role-taking and class inclusion. These training procedures can be described following Sigel and Cocking (1977), as relying on verbal inducement of conflict. In training for class inclusion the intention was to try to provide subjects with opportunities to realize how and why their preoperational judgments were inconsistent. Role-taking training was oriented to creating an awareness that the perspective of another person who did not see the whole story was different.

To summarize, the present study was designed (a) to establish the asynchrony between class inclusion and role-taking on an Irish sample and a French sample of preoperational children, and (b) to investigate whether this asynchrony is merely a function of the difficulty of the measures used or whether a developmental sequence is entailed by the sequence. If training is uniquely task specific then the sequence is probably without developmental significance. However if training transfers to the untrained skill then the nature of the mediational linkage involved may be inferred.

Method

Subjects

The subjects were 72 Irish boys tested in the spring and 72 French boys and girls tested in the early autumn. The Irish subjects were divided equally between two grade levels, junior infants and first class, in a Dublin school. The mean age of subjects at each grade level was 5-4

years and 7-4 years respectively. The French subjects, from three Parisian schools, were selected also from two grade levels, cours préparatoire and cours élémentaire première année, and their mean ages were 6-7 years and 7-5 years respectively. Both the Irish and the French samples were each randomly assigned within grade level to a control group, or one of two training groups, class inclusion training or role-taking training. In the case of the French sample this random assignment was made so that each treatment condition at each grade level contained equal numbers of boys and girls.

Measures

Six tasks were used to measure class inclusion. Three cartoons, each of which was followed by two role-taking questions, were used to measure role-taking ability.

Class inclusion. The materials used were six sheets of white cardboard measuring eight by five inches. The faces of two of the sheets showed line drawings of rabbits and cats: Nine rabbits and three cats appeared at opposite ends of one sheet; seven rabbits and five cats appeared at opposite ends of the other. Two other sheets showed green circles (diameter one inch) and green squares (side one inch): Nine circles and three squares appeared at opposite ends of one sheet; seven circles and five squares appeared at opposite ends of the other. The remaining two sheets showed drawings of little fish and big fish: Nine little fish and three big fish appeared at opposite ends of one sheet; seven little fish and five big fish appeared at opposite ends of the other.

In assessing class inclusion subjects were shown a card and asked to count the numbers of objects within each subordinate class. If shown the first card described, for example, the subject was asked how many cats there were and how many rabbits. When this was established the subject

was asked whether there were more rabbits or cats. This comparison was always presented so that the larger subordinate class was stated first, i.e., nine objects versus three objects, or seven objects versus five objects. Then the subject was asked whether there were more rabbits or animals, and asked to explain the answer. This comparison was always between the larger subordinate class and the superordinate class. Subjects received a score of three if they gave correct answers which they were able to justify, e.g., by saying on the first task described above that there were more animals because there were cats too, or all were animals. Correct but unjustified answers received a score of two, and incorrect answers received a score of one.

Role-taking. Three cartoons were used to assess role-taking ability. They have been described fully in Gash (Note 2). The cartoons used were the woman and car cartoon, the pig and wolf cartoon, and the snowball cartoon. Briefly, subjects first described the sequence. Then they were asked how another child (of same sex and age as the subject but in another school) would (1) reconstruct the ending if shown only the beginning (a next question) and (2) reconstruct the beginning if shown only the ending (a before question). The consistency of these measures of role-taking has been assessed in detail in Gash (Note 2). Gamma coefficients (Goodman & Kruscal, 1954) between pairs of role-taking questions ranged from 0.45 to 0.94, averaging 0.76, for 164 subjects distributed across grades one to four. Gamma coefficients were used as the role-taking variables are developmental and the value of gamma can be taken as the probability of correctly guessing that a subject will be egocentric on the second role-taking question if it is known that the response to the first question was egocentric. For some of the analyses egocentric responses were scored one

and decentered responses were scored two.

Procedure

The subjects were tested individually by the author in a private room in their school. In Dublin subjects received a pretest, treatment, and posttest on different days in the same week. In Paris the treatment was administered immediately after the pretest. The posttest was administered on the day following the treatment. The role-taking questions have been shown to have different difficulties (Gash, Note 2). The measures of role-taking and class inclusion used for every three subjects in each treatment group were identical. Thus each treatment group can be considered as having received identical measures of role-taking and class inclusion. During the pretest each subject was shown one of the three cartoons, asked the two role-taking questions based on it, and then asked two class inclusion questions. The snowball cartoon was followed by the class inclusion questions based on nine little fish and on seven rabbits. The woman and car cartoon was followed by the class inclusion questions based on nine rabbits and seven circles. The pig and wolf cartoon was followed by the class inclusion questions based on nine circles and seven little fish. Subjects who received the snowball cartoon as a pretest received the pig and wolf cartoon as a posttest (and so received the class inclusion questions based on nine circles and seven little fish). Those who received the pig and wolf cartoon as a pretest received the woman and car cartoon as a posttest, and those who received the woman and car cartoon as a pretest received the snowball cartoon as a posttest.

Two orders were used in the administration of role-taking and class inclusion questions. Half the subjects received next questions first and before questions second during the pretest; these subjects received the nine versus three object class inclusion question first and the seven

versus five object class inclusion question second. The other half of the subjects on their pretest received the before question first, the next question second, and the class inclusion questions were also reversed in order. For all subjects the order of role-taking questions (next & before) and class inclusion questions (nine versus three or seven versus five) was changed on the posttest. Subjects scoring maximum points on the pretest were replaced.

Treatments

Class inclusion. All subjects were trained individually. "Training" in class inclusion was more flexibly structured than assessment of class inclusion in the pretest or the posttest. The instructional format followed a pattern based on and extending beyond the testing experience. The presentation was sequenced in approximately the same way for each subject, though sessions varied in details such as precise wording of questions, depending on the experimenter's judgment of the subject's requirements. A further variation was that training was terminated if a subject clearly understood class inclusion during the training session. The aim of the training was to make subjects aware of the inconsistencies in their own reasoning. In theoretical terms the purpose of the instruction was to induce cognitive conflict in a subject's thinking so that equilibration could procede.

First the subject was required to identify the number of small plastic animals (six, four cows and two sheep) and then the number of cows and sheep. Then class inclusion questions were asked following the format used in the pretest: "Are there more cows or sheep? Are there more cows or animals?" Subjects who said that there were more cows were asked to identify the number of animals again (sometimes this entailed asking the subject to recount the animals) and the number of cows. If the inconsistency was not noticed the question was repeated: "Are there

more cows or animals?" If the answer was again "cows" then the subject was asked to recount the cows and animals and the number of each was written down to provide another opportunity for the subject to realize that six animals is more than four cows.

Finally subjects were shown the pretest class inclusion questions which they had answered preoperationally and asked to count the number of elements in the superordinate class (fish, green things, or animals) and they were reminded of their answers. Then they were asked these questions again so that they had an opportunity to understand the errors which they had made. The training session lasted about five minutes per child.

Role-taking. In Dublin subjects were trained in pairs under the condition that both had received identical pretests. In Paris subjects were trained individually. A cartoon was read by the experimenter. The story was about a father and son who go by bicycle from their country cottage, via a wood and a four lane road to a supermarket. They purchase various items and then return home. Once home the dinner is prepared and the washing is done. During the story each subject was asked a number of times to anticipate what was going to happen next. These anticipations were posed as follows with subjects looking at the pictures: as father and son leave home (what do you think will happen in the story?); as the father and son go into the wood (what do you think they will see in the wood?); when they are on the main road (what do you think is going to happen next?); as they arrive at the supermarket (what are they going to buy?); and when they arrive home again (who is going to cook the dinner?).

When a subject guessed incorrectly, which was usually, the experimenter pointed out that the guess was wrong, so providing an opportunity for subjects to experience uncertainty. After the subjects had guessed what the father and son were going to buy at the supermarket the exper-

imenter said: "It is hard to know exactly what they are going to buy since you don't know the story. You don't know what is going to happen until you have seen the whole story do you?" At this point subjects either agreed immediately or the experimenter made reference to all the incorrect guesses made to the preceding questions thereby eliciting agreement. The experimenter continued: "Do you remember the boy/girl who didn't know the whole cartoon story because he/she hadn't seen all the pictures? Well he/she is rather like you, isn't he/she, because he/she doesn't know the story either? He/she might think that something different happened." Following this the remaining part of the story was read and the last question was asked (who is going to cook the dinner?). Subjects were finally given an opportunity to try to think of decentered responses to the role-taking questions which they had answered egocentrically on the pretest. This training session also lasted about five minutes.

Control group. In Dublin subjects were seen in pairs and in Paris subjects were seen individually. The cartoon story used in the role-taking training program was read to the subjects but no questions were asked. The purpose of reading the story to the subjects in the control group was to allow these subjects to have approximately the same contact with the experimenter as subjects in the other treatment conditions. The control session lasted about four minutes.

Results

Preliminary Analyses

Order and sex effects. Order effects were examined by forming two by two matrices contrasting order and type of response (egocentric & decentered, or preoperational & operational) for each item on the pretest separately (two role-taking questions & two class inclusion questions) and each posttest item separately for the Dublin sample and then for the Paris sample and calculating χ^2 values. There were no significant order effects.

Sex effects were examined in an identical manner for the Paris sample. There were no sex effects and in subsequent analyses sex was not included as a variable.

Asynchrony between Class Inclusion and Role-Taking

In America (Gash & Smock (in press)) and in India (Behl & Gash (in press)) class inclusion was shown to be developmentally prior to role-taking for these tasks. In this present study the generality of this sequence was examined by forming two by two matrices contrasting responses to the two class inclusion pretest items with responses to the two role-taking questions on the pretest. In this analysis decentered on role-taking meant that both responses were decentered and operational on class inclusion meant that both responses were correct and justified. McNemar's χ^2 was used to show that there were significantly more subjects who would be operational on class inclusion and egocentric on role-taking than vice versa. This prediction was confirmed in Dublin (χ^2 (1) 3.37, $p < .05$, 1 tailed) and in Paris (χ^2 (1) 7.03, $p < .005$, 1 tailed). This analysis was repeated at each grade level in both Dublin and Paris subsamples. At the lower grade level in each subsample most subjects

were preoperational on the class inclusion pretest (Dublin 94%, Paris 86%) and therefore while the trend was in the expected direction it was not significant. In the Dublin sample in the upper grade level 44% of the subjects were transitional (operational on only one of the two measures) and there were significantly more subjects who were operational on class inclusion and egocentric on role-taking than vice versa [χ^2 (1) = 3.06, $p < .05$, 1 tailed]. In the upper grade level in Paris there were slightly fewer transitional subjects (33%) and the trend was also significant [χ^2 (1) = 7.04, $p < .005$, 1 tailed].

Treatment Effects

Treatment effects were assessed with the use of quantitative scores on pretests and posttests. To test the significance of the gains in posttest scores both pretest and posttest scores were considered as deviations from the mean of pretest and posttest scores within each treatment group. These deviation scores are presented in Figure 1 for the variables class inclusion and role-taking for the total sample since the pattern within Dublin and Paris subsamples was essentially the same. The usual multivariate analysis of variance model was used to test the hypothesis that these deviation vectors did not differ significantly from the null vector; i.e., that these deviations are no more then measurement errors. This procedure is recommended by Tatsuoka (1973) because of well known problems with the measurement of change.

Insert Figure 1 about here

The hypothesis that the deviation vectors considered together did not differ significantly from the null vector was rejected for class inclusion scores [$F(2,140) = 9.16$, $p < .001$] and for the role-taking

scores [$\underline{F}$ (2,140) = 7.66, $\underline{p} < .001$].

Analysis of the class inclusion scores for each treatment condition separately showed that only the group trained on class inclusion has deviation scores which differed significantly from the null vector [$\underline{F}(2,45) = 12.21$, $\underline{p} < .001$]. There was virtually no difference between pretest and posttest class inclusion scores for the control group [$\underline{F}$ (2,45) = 0.02] and the increase in the group trained on role-taking was not significant.

These within group analyses were repeated at the upper (seven year old) and lower (combining five and six year olds) grade levels for each treatment condition. Deviation from the null vector of the class inclusion scores was significant at both upper and lower grade levels for the groups trained on class inclusion [$\underline{F}(2,21) = 20.84$, $\underline{p} < .001$, and $\underline{F}(2,21) = 3.57$, $\underline{p} < .05$ respectively]. However at the upper grade level the class inclusion deviation scores differed significantly from the null vector for the group trained on role-taking [$\underline{F}(2,21) = 5.46$, $\underline{p} < .01$].

Turning to the role-taking scores, the within group analysis of deviation scores for each treatment group separately showed that significant deviation from the null vector occurred only in the case of the group trained on role-taking [$\underline{F}(2,45) = 4.65$, $\underline{p} < .025$]. The control group showed virtually no difference between pretest and posttest role-taking scores [$\underline{F}(2,45) = 0.16$] and the posttest increase for the group trained on class inclusion was not significant.

Repetition of these within group analyses at upper and lower grade levels showed that it was only at the upper grade level that the role-taking deviation scores for the group trained on role-taking differed significantly from the null vector [$\underline{F}(2,21) = 9.15$, $\underline{p} < .005$].

Discussion

The data obtained in this study confirm a developmental asynchrony between class inclusion and role-taking in which significantly more subjects are operational on class inclusion and egocentric on role-taking than vice versa for the measures used. This particular asynchrony has been demonstrated in America (Gash & Smock, in press) in India (Behl & Gash, in press) and now in Ireland and France. Therefore it holds in English speaking subjects, Hindi speaking subjects, and in French speaking subjects; generally the Hindi speaking subjects also spoke English whereas the French speaking subjects did not. The possibility was considered by Gash and Smock (in press) as it had been by Miller, Kessel, and Flavell (1970) that class inclusion [concrete operational grouping structure I (Flavell, 1963)] was necessary to role-taking. Following Wohlwill (1973), however, the persistent presence of small numbers of subjects who were decentered on role-taking and preoperational on class inclusion might have been interpreted as being inconsistent with the idea that concrete operational grouping structure I was a necessary prerequisite to role-taking. In other words the two by two matrices did not show that there were no subjects who were decentered on role-taking and preoperational on class inclusion. While it is possible that the two abilities are independent the present training study was necessary to explore the nature of the interdependence between role-taking and class inclusion.

One of the criteria of Piaget's stage concept is that there be interrelation between similar but different cognitive structures. Generalization of training effects from a logical to a social competence or vice versa would constitute support for this central Piagetian thesis. The possibility of investigating structural interrelation of this type

depends on training the skills involved successfully. The training programs designed for both role-taking and for class inclusion were effective and the developmental sequence found for class inclusion and role-taking was reflected in the trainability of these skills with these training techniques because class inclusion was trained at both grade levels whereas role-taking was trained only at the upper grade level.

The classical Piagetian argument is that if class inclusion is necessary for role-taking then training in class inclusion, if successful, ought to be reflected in augmented role-taking scores. The present study did not find this type of relation to hold between class inclusion and role-taking. There were significant increases in class inclusion scores at both grade levels and there were also increases in the role-taking scores, but these latter increases were not above chance levels.

Training in role-taking, when successful, appears to provide adequate opportunity for exercising and acquiring class inclusion skills. So at the upper grade level (seven year old children), where role-taking scores increased significantly class inclusion scores were also augmented. One cannot conclude that role-taking is necessary to class inclusion because of the well established asynchrony: class inclusion then role-taking. The developmental relation must be of another form. It seems that one must conclude that this type of role-taking includes the mental operations necessary to class inclusion; that is, the operations which combine, separate, and coordinate mental items without destroying them in the process. These two forms of understanding, therefore, one logical and the other social, may be more closely related than Hollos (1975) has suggested.

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2. Gash, H. Cognitive operations in role-taking. Manuscript submitted for publication, 1979.

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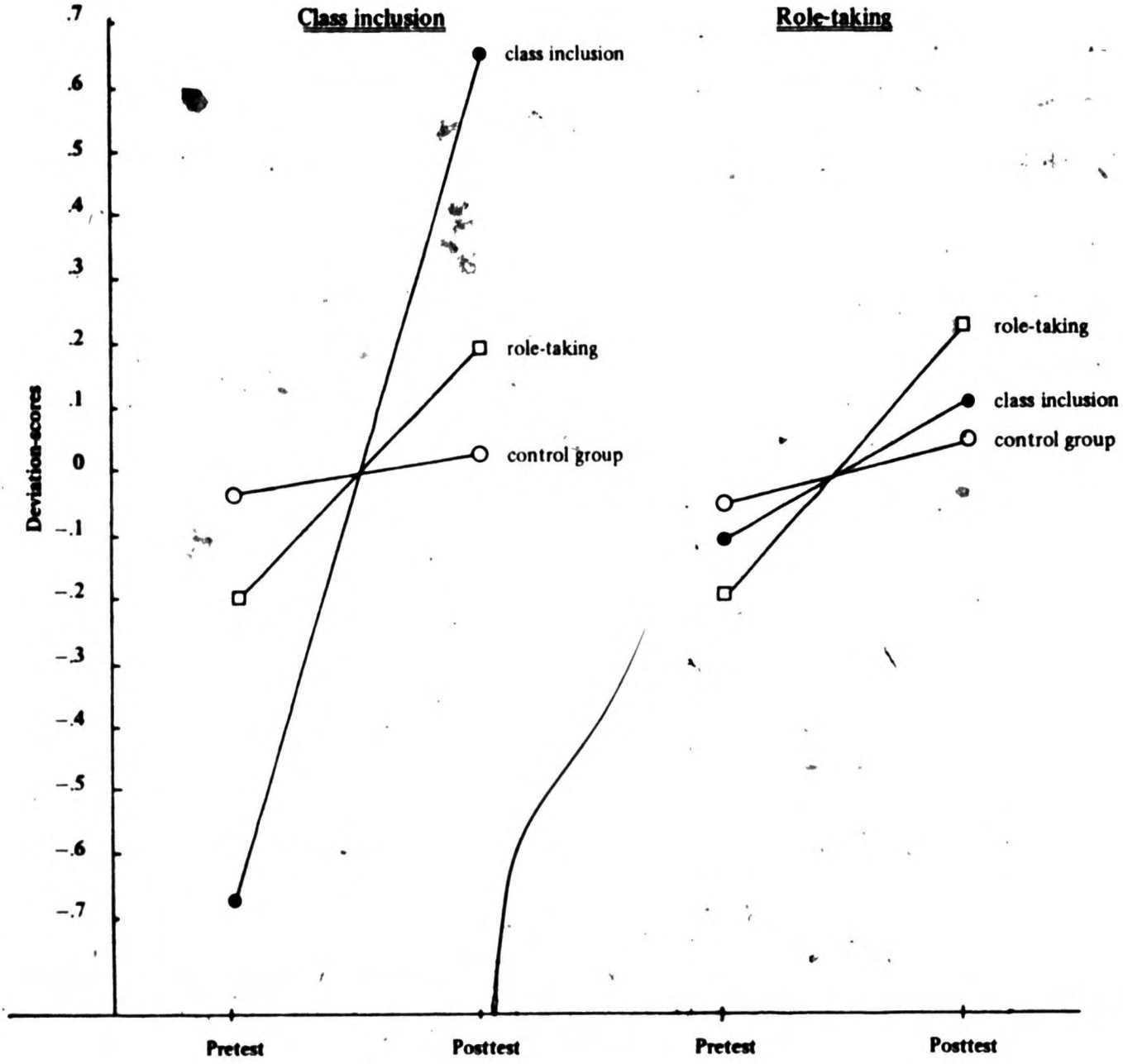
Figure Captions

Figure 1. Deviations of treatment groups about the mean of pretest and posttest scores. (Raw score range for class inclusion 2 - 6 and for role-taking 2 - 4).


Class inclusion
Role-taking
class inclusion
role-taking
control group
role-taking
class inclusion
control group
Deviation-scores
.7
.6
.5
.4
.3
.2
.1
0
-.1
-.2
-.3
-.4
-.5
-.6
-.7
Pretest
Posttest
Pretest
Posttest