INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and reproduce this document, the quality of the reproduction is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.

2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.

3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of "sectioning" the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.

4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.

5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.

University Microfilms International
300 N. Zeeb Road
Ann Arbor, MI 48106

Lino, Barbara

PEER RELATIONS, SOCIAL INTERACTION AND COGNITIVE GROWTH

City University of New York PH.D. 1985

PEER RELATIONS, SOCIAL INTERACTION AND COGNITIVE GROWTH

by

BARBARA LINO

A dissertation submitted to the Graduate Faculty in Educational Psychology in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1985

This manuscript has been read and accepted for the Graduate Faculty in Educational Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

4/15/85
date

Chairperson of Examining Committee

4/15/85
date

Executive Officer

Dr. Joseph Glick

Dr. David Rindskopf

Dr. Barry Zimmerman

Dr. David Bearison

Supervisory Committee

Abstract

Peer Relations, Social Interaction and Cognitive Growth

by

Barbara Lino

Advisor: Professor Joseph Glick

This study had two main purposes. The first was to determine whether a relationship existed between the amount of change children made during social problem solving, and the extent of subsequent individual progress. The second purpose was to examine the influence of friendship upon the nature and course of social problem solving. Prior cognitive developmental studies in this area have focused exclusively on demonstrating the importance of the cognitive relationships which exist between partners in order for them to profit from social interaction. They have not, thus far, examined the possible effects of the type of affective relationships which may exist between the partners.

Sixty-four fifth graders (mean age = 10.7) were assigned to same-sexed pairs of friends or non-friends. Children were individually pretested on a spatial perspective-taking task and each dyad consisted of a low ability (NC) and medium ability (PC) level child. During the social interaction phase, the partners initially worked separately on four block arrangements. After each was completed, they then compared and could modify their arrangements. The children were individually posttested approximately three weeks after social problem solving.

The results revealed no significant differences between friends and non-friends. An explanation is forwarded suggesting that in this study, the goal or purpose of the task generally took precedence over existing social relationships between partners. All children behaved in a task-oriented manner. For the friendship group, children who worked with their second friendship choice were found to modify their respective arrangements during social problem solving significantly more than children who worked with their first choice (best friend).

The findings are interpreted as offering limited support to a socio-cognitive conflict model of development. Both NCs and PCs made significant pre- to posttest gains, and the highest level of functioning was evidenced during the time when the children worked collaboratively on their respective arrangements. However, contrary to the theoretical formulations of a socio-cognitive conflict model, no significant relationship was found between the amount of change children evidenced during social interaction, and subsequent individual gain.

Acknowledgments

I would like to express my appreciation to my chairperson, Dr. Joseph Glick. His comments were invaluable as they helped me to focus on the central issues raised by this project. My appreciation also goes to the other members of my committee, Dr. David Rindskopf, Dr. Barry Zimmerman, and Dr. David Bearison for their ongoing guidance and support during the development and writing of this dissertation.

My deep appreciation is also extended to the staff and students of P.S. 7 (M) and the Holy Name School. Their cooperation enabled me to collect the data for the present study.

I also want to give a special thank you to my father, Alfonso Lino, for his encouragement and support throughout the many years I've been involved in post-graduate studies. Much gratitude also goes to my husband, Kazu Fukuda, for his patience, encouragement and fortitude.

This dissertation is dedicated to the memory of my mother, Rose Lino.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

Introduction

Piaget's and Vygotsky's Theories: The role of social interaction upon cognitive growth

Piaget and Vygotsky offer two different accounts of the origin and development of cognition. Piaget's equilibration model is based upon a viewpoint centered exclusively on the individual. Although his early, seminal work, The Moral Judgment of the Child (1932), includes observations which concern the social development of the individual, the socialization process itself is subordinated to the assimilatory capacities of the internal "knowing" structures within the child. For Piaget, thought is individual in origin and becomes progressively more socially determined. According to the level of development of the individual, the exchanges with the social environment will be very different, and these in turn modify individual mental structures in equally different ways. In The Psychology of Intelligence (1960), Piaget states that the ability to cooperate is linked with the development of operations, but insists upon the simultaneously social and individual nature of logic. He writes that as the child's "intuitions articulate themselves operationally, the more adept the child becomes at co-operation, a social relationship which is quite distinct from coercion in that it involves a reciprocity between individuals who know how to differentiate their viewpoints...On the other hand, from the psychological point of view - which is our point of view here - logic itself does not consist solely of a system of free operations; it expresses itself as a complex of states of awareness, intellectual feelings and responses, all of which are

characterized by certain obligations whose social character is difficult to deny, be it primary or derived" (pp. 162-163).

Perret-Clermont (1980) in reviewing these ideas writes:

> ...it would appear that it is only that expression of intelligence which Piaget calls "true thought", i.e. operational, which can be considered socialized. This is a notion which seems reductivist of both intelligence and socialization. Piaget himself provides the possibility, in his other studies, of introducing a much clearer distinction between, on the one hand, the nature of intelligence, with its developmental origins, and, on the other hand, the forms which intelligence may adopt. Is it not precisely these forms which may be more or less regulated by the system of relations which Piaget represents as being optimal and rational: i.e. "cooperation"? To set up, as Piaget does, a structural isomorphism between operational intelligence and cooperative behaviours should not imply that the social factor, which indeed is described elsewhere...as "the third fundamental factor in mental growth" has no role to play in other stages of development. Nor does it entail the absence of isomorphisms at other levels... (p. 12).

Perret-Clermont notes that Piaget has obviously concentrated on the role of cooperation as a social factor in cognitive growth. Perret-Clermont has moved toward an approach more similar to that of Mead (1934) and Vygotsky (1934; 1978), who propose that social interaction exercises a causal effect on cognitive development. Perret-Clermont argues that there may be forms of relationships and exchanges which prepare the way for cooperation because they are involved in the genesis of structures of operations from which cooperation arises. A similar viewpoint has been espoused by Bearison (1983) who notes that "social cognition not only reflects the development of social knowledge but also the social development of knowledge. All knowledge is inherently social in that the ontogenesis of mental development is motivated and

maintained by social discourse" (p. 202).

Within Piagetian theory, the presence of a social environment is considered as a "given". Bearison and Cassel (1975) note that for Piaget the role of social interaction is to create for the "developing individual certain types of cognitive conflicts which are then resolved through the formation of higher order operations. However, the quality and/or structural complexity of an individual's social environment and how it effects his development is never specified by Piaget" (pp. 29-30).

Vygotsky, like Mead, proposes that the social context and social interaction is central to cognitive development, as it is responsible for the development of all higher mental functions. In marked contrast to Piaget's position, Vygotsky (1934) states: "In our conception, the true direction of the development of thinking is not from the individual to the socialized, but from the social to the individual" (p.20). Wertsch (1979) in explicating Vygotsky's theory, notes that within this framework "any higher mental function was external because it was social at some point before becoming an internal, truly mental function. It was first a social relation between two people. The means for influencing oneself originally were means of influencing others or others' means of influencing an individual" (p. 2).

While Vygotsky's and Piaget's views on the origin of thought are diametrically opposed, important similarities between their theories nonetheless exist. Both are dynamic models which place importance on the role of interactive activity and view reasoning as a developmental process which undergoes structural change. For example, Vygotsky's "zone of proximal development" defined as "the distance between the actual developmental level as determined by independent problem

solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (Vygotsky, 1978, p.86), shares certain striking similarities to the conceptual framework employed by Piagetian training studies (Kuhn, 1972; Turiel, 1969) which have found that children prefer and make gains when exposed to reasoning which is one stage above that of their current level.

Experimental Investigations based on Piaget's and Vygotsky's Theoretical Models

For the purpose of this discussion, three lines of research will be presented. Two of the groups of investigations have been influenced by Piaget's equilibration theory as they are based on the premise that cognitive conflict and the coordination of actions leads to structural changes in children's level of reasoning. However, the first body of studies to be reported are more closely aligned to Piaget's focus as they have examined the effects of what may be referred to as the role of intra-individual conflict upon subsequent cognitive growth. The following section will describe two studies based on a Vygotskian approach to cognitive change. The last section will describe studies which focus upon the influence of socio-cognitive conflict upon cognitive gain. The many studies conducted by Doise and his collaborators have employed this social interactive approach. Their orientation shares certain similarities to both Vygotsky's and Piaget's theories and can, in certain respects, be viewed as an attempt to synthesize these models.

Cognitive Conflict Model (Intra-Individual) of Cognitive Growth

Upon reviewing the literature aimed at empirical demonstrations of Piaget's equilibration model, it becomes immediately apparent that

"cognitive conflict" has been defined in several ways. Training studies pertaining to the acquistion of operational notions, usually conservation reasoning abilities, have attempted to experimentally induce what can be identified as three different types of conflict.

The first type of conflict is that which emerges between hypotheses and observations of findings which may disconfirm them, creating what could be described as intellectual dissatisfaction (Inhelder, Sinclair and Bovet, 1974; Lefebvre and Pinard, 1972). The experimental paradigm attempts to highlight contradictions between the child's initial hypotheses and the knowledge gained from his/her active manipulation of physical objects. The disequilibrium which results from these conflicts is viewed as necessitating attempts to coordinate and thus resolve these differences on a structurally more stable and elaborate plane.

A second type of conflict arises when different schemata or "subsystems" are simultaneously brought into play but are contradictory (Inhelder, Sinclair & Bovet, 1974). In this case also, these contradictory "subsystems" must be coordinated in order for the conflict to be resolved and growth to occur.

A third type of experimentally induced conflict involves the child's exposure to levels of reasoning which are different or contrasting to that of his/her own. Kuhn (1972) pretested children to determine their initial classification state level and assigned them to watch an adult model who performed at either a) the same stage as the child but in a manner different in content from that of the child's; b) a stage one below the child's; c) a stage one above the child's; d) two stages above the child's. Immediately following the modeling phase,

each child was posttested on the classfication task and again one week after the first posttest. Results indicated that the greatest change occurred when children observed an adult model perform one stage above their own. Less change occured when children viewed performance two stages above their own; they made the least amount of progress when exposed to same stage and one stage below forms of classification behavior. These results indicate that there is an optimal distance or mismatch between the child's developmental level and that to which he/she is exposed, whereby cognitive conflict can occur, be experienced, and lead to structural progress. It is important to note that the models were not viewed as determining the form of cognitive change. Instead, their role was to act as a source of stimulation to produce conflicts between the child's initial level of reasoning and the one to which he/she was exposed.

Vygotskian Model of Cognitive Growth

In the experimental paradigm employed by Kuhn (1972), adults were used as models to be observed by the child, but they did not interact with the child in the sense of there being reciprocal exchanges. It is of interest to note that until recently, real interactions with the child have been largely ignored as far as the adult partner is concerned even when the latter plays a significant role in the child's ongoing development. Mugny, Perret-Clermont & Doise (1981) have noted the absence of such types of investigations writing: "one can easily guess that an omission of this kind arises in reality from a very narrow conception of the pedagogic relationship as the social transmission of a cultural heritage, abstracted from all contexts of elaboration, exchange, and cooperation between child and adult" (p. 317).

Two studies, however, have examined the interactions between mothers and their children and both set up similar problem solving situations involving the assembly of a toy. The study by Wertsch (1979) is an explicit application of Vygotsky's theory while the study by Wood and Middleton (1975) does not specifically refer to Vygotsky but parallels his theoretical orientation.

Wood and Middleton (1975) examined the interactions between 12 mothers and their children in a problem solving situation. The child's task was to assemble a construction toy and the mother's task was to attempt to help him/her in such a way that she/he would eventually be able to construct the toy alone. The results indicated that the children whose mothers systematically changed their instructions on the basis of the child's response to earlier interventions were likely to perform effectively after instruction. These mothers were found to be the most likely to determine and concentrate upon what the authors' refer to as the child's 'region of sensitivity to instruction' (or, in Vygotsky's terminology, the 'zone of proximal development'). The authors conclude that "effective instructing is a dynamic, interactive process somewhat akin to problem solving. (The study) elaborates the view that the process of intellectual development must be viewed as a social, interactive one" (p. 181).

Wertsch (1979) developed a puzzle-making task situation that mothers and their 2½, 3½ and 4½ year old children were to do together. The puzzle depicted a truck and a "model" puzzle was placed near the "copy" on which the child was working. The child's task was to make the copy look exactly like the model. The mothers were instructed to simply help their children whenever they thought it was necessary.

Wertsch writes: "Once the child agreed that she/he needed help from the mother...the communicative situation became one in which the mother's utterances were used to regulate the child's performances in the task. Thus we have a case of adult-child interaction in which the adult is providing other-regulation in the zone of proximal development" (p. 7). He identified and characterized four successive levels to the transition from other-regulation to self-regulation on this new puzzle-making activity.

Briefly, during the first level the child's understanding of the task situation is so limited that communication is very difficult. "Rather than trying to regulate the child's activity by relying on the definition of situation that may exist for adult speakers, the adult must use speech and gestures which are tied to the definition of situation that exists for the child" (p. 11).. During the second level the child begins to participate successfully, but his/her understanding of the task situation is still far from being in complete agreement with the adult's. At the third level, the child can function adequately in the other-regulation situation. "While the process is still carried out at the interpersonal plane, the fact that the child can make all these inferences indicates that self-regulation is beginning to account for much of his/her performance" (p. 15). At the fourth level, "the problem-solving activity shifts from the interpsychological to the intrapsychological plane and the transition from other-regulation to self-regulation is completed. The child carries out the task without any strategic assistance from the adult" (p. 19).

Wertsch concludes that "the progression from one level to the next in the zone of proximal development is largely the result of the child's

own efforts to establish and maintain coherence between his/her own action and the adult's speech" (p. 20). For the child in the zone of proximal development, "the coherence between speech and action must be created rather than assumed. One of the major ways that it is created for the child is by carrying out the behaviors specified by the adult and then building a coherent account of the relationships among speech, definition of situation and behavior. This means that it is not the case that the child first carries out the task because she/he shares the adult's definition of situation. It is precisely the reverse: she/he comes to share the adult's definition of situation because she/he carries out the task (through other regulation)...this means that coherence is created by the child's adjusting his/her definition of situation so that it is consistent with his/her behavior" (p. 20).

Socio-Cognitive Conflict Model (Inter-Individual) of Cognitive Growth

Doise and his collaborators in Geneva have sought to demonstrate "the chains of circular (or spiral) casuality which connects individual cognitive functions with the interpersonal interactions in which the child participates" (Mugny, Perret-Clermont & Doise, 1981, pp. 315-316). They begin with the premise that social interactions which engender 'socio-cognitive conflict' play a powerful role in promoting cognitive change. They define this type of conflict as occuring when "a change in the individual's strategy of responses has its explicit source in a conflict between his initial response and the response strategy of one or several others" (p. 316). Using Piagetian tasks, they have compared the cognitive performances of children working singly with the performances of children working in social interaction with other children or adults.

Mugny et al. (1981) state:

> The central idea of our approach is that cognitive development does not result simply from the interaction of the child with his surroundings in his non-social environment, but that this interaction is always mediated by, and therefore derives its meaning from, his social interactions with his peers and with the adults of his acquaintance. In this sense we are dealing with a socio-interactive approach, which is also a constructivist perspective, since we maintain (with Piaget) that cognition is not a copying process, a passive appropriation, but that it is indeed a construction by the active subject (or, to emphasize the psychosociological perspective, interactive subject), which therefore takes place during social interaction (pp. 318-319).

Their orientation also shares similarities with that of Vygotsky's in that they propose: "the inter-individual elaboration of cognitive strategies initially precedes their intra-individual elaboration" (p. 319). One of the hypotheses which derives from this premise is that inter-individual coordinations will consequently be superior to intra-individual coordinations. Several of their studies have confirmed this hypothesis.

Doise, Mugny & Perret-Clermont (1975) reported the results of two experiments. The first used a spatial transformation task. Children were shown a model "village" of three or four houses placed in specific locations on a cardboard base. The base has a "mark" which serves as a reference point for the orientation to the base. The children are given identical materials to construct a copy of the village with the base of the copy at different orientations relative to the base of the model. Bearison (1983) in discussing this particular task notes: "Compared to most measures of concrete operations, and conservation in particular, the spatial perspective task is particularly appropriate

for social interaction studies. Whereas a conservation task is a verbal-reasoning problem, the spatial perspective task, using the construction response, relies more on task directed activities and less on verbal reasoning. In a social interaction condition, the task can be solved by two children directly acting on the task materials without the need to completely talk the problem out with one another" (p. 209).

Using this spatial transformation task, Doise et al. (1975) attempted to show that certain forms of social interaction which allow individual children to coordinate their actions with the action of other children result in cognitive performances which are better structured than those in an individual situation. These results were based on both a comparison of collective performances to control subjects working individually, and on statistical analyses which indicated that the success of any one individual in the pairing was not sufficient to account for the more successful dyadic performances.

In the second experiment (Doise et al., 1975), children were initially pretested to ascertain their current level of reasoning on Piaget's conservation of liquids task. They were subsequently assigned to individual (control) or collective conditions. In the collective condition, a nonconcerver or intermediate conserver worked with two conservers. A week after the social situation, the nonconservers and intermediate conservers from both the collective and control conditions were individually posttested in a manner similar to the pretest but which also included a different item in order to question each child about new kinds of pouring. Nonconservers and intermediate conservers from the collective condition were administered a second posttest, identical to the first, about one month later. The results indicated that

cognitive modifications occuring during social interaction "are internalized and can later be re-activated by the individual child in a situation marked by the absence of interaction between equals" (p. 368). They found that the internalization of these operations led to an understanding of the concepts employed which were structurally more elaborate. Children revealed this understanding by using explanations which involved valid and explicit arguments which were not heard during the social interactive situation and which were pertinent to the attainment of operational thought.

Both experiments produced similar and particularly important findings which indicate that the results achieved in an interactive situation cannot be equated with the performance of the better partners. Indeed, in one of their studies (Mugny & Doise, 1978) employing the spatial transformation task, the most successful dyadic combinations were those in which a child with an inferior pretest performance (Non Compensator) and a child with an intermediate pretest level of performance (Partial Compensator) worked together. The results indicated that these children were able to solve tasks collectively which neither one was able to do alone during the pretest, and that both children made gains when their individual posttest performance was compared to that of their pretest functioning.

Doise and Mugny (1979) have also provided evidence which suggests that children involved in inter-individual conflicts of centrations show relatively superior performance on the spatial transformation task when compared to children who are confronted with their own contradictory responses. Children, identified from the pretest as demonstrating either inferior or intermediate levels of performance on this task, were paired

with a child of the same cognitive level. The partners worked together at opposite sides of the table where the experimental material (the model village) was arranged. In the control condition, individual children were allowed to move from one side of the table to the other, in order to determine whether children who work from successive opposed viewpoints also experience conflict. The children who were confronted with a contrasting point of view in the interpersonal situation coordinated their perspectives and resolved their differences, resulting in better performance than was obtained from those children who did not engage in interaction and successively viewed static perspectives.

Perret-Clermont (1980) offers an explanation for the general superiority of collective vs. individual performances: "the cause of the cognitive development observed is to be found in the conflict of centrations which the subject experiences during the interaction. The interaction obliges the subject to coordinate their actions with those of others, and this brings about a decentration in the encounter with other points of view which can only be assimilated if cognitive restructuring takes place" (p. 148).

Accordingly, it should not be necessary for children, in the course of social problem solving, to be exposed to the "correct" solution, but only to a 'conflict of centrations'. This has been demonstrated in a study conducted by Bearison (1983). Using the spatial transformation task developed by Doise et al., he found that "the particular dyadic combination that showed the greatest progress was the one in which both children had pretest scores of zero" (p. 214). Doise, Mugny and Perret-Clermont (1976) used a conservation of length task to determine whether children would make gains after interacting with an adult functioning

at the same pre-operatory level as the child, but whose solutions contradicted those of the child's. In another experimental condition, the adult provided a correct judgment and explanation of conservation. Children in the control condition did not engage in any interactive situation. Posttest results indicated that growth occured not only when children experienced conflicting viewpoints which were more advanced than their own, but also when conflicts of centrations were on the same level as their own. Furthermore, an examination of the arguments provided during the immediate and delayed posttests provided additional evidence that structural change had occured. It was found that the vast majority of explanations were novel and could not be accounted for by the process of simply imitating the adult's verbalizations.

Social Learning Theory Model of Cognitive Change

The structural theories proposed by Piaget, Doise and his collaborators, and Vygotsky are all based upon a constructivist perspective, i.e. cognitive development is the result of the child's actively coordinating and thereby resolving conflicts/contradictions which emerge during the course of interaction. While Vygotsky's theory may not appear to easily fit within this framework, Wertsch's (1979) stress on the child's "own efforts to establish and maintain coherence between his/her own actions and the adult's speech" (p. 20) (italics added), demonstrates the need for conflict and coordination if cognitive growth is to occur.

In contrast to such explanations, social learning theory recognizes the importance of social influences on cognition, but argues that cognitive conflict is not necessary. Zimmerman & Blum (1983) in describing this perspective write: "While the effects of external and

and internal conflict are recognized as frequently occuring during social encounters, conflict is not considered by social learning theorists to be crucial to learning....Other parameters of social experience are emphasized as more important during rule learning such as the clarity and consistency of modeled information" (p. 19). They view the child's observational learning of conservation as a form of 'rule acquisition' and have shown that children experience significant cognitive gains by observing a model demonstrate the correct solution (Rosenthal & Zimmerman, 1972; Zimmerman and Rosenthal, 1972; Zimmerman & Lanaro, 1974).

An early study by Rosenthal and Zimmerman (1972) examined the influence of modeling procedures on children's conservation performances. First grade children were pretested on conservation items and non-conserving children were assigned to either an experimental modeling condition or a control condition. In the modeling condition, children observed an adult giving conservation responses to six different tasks. In the control condition, the children did not observe a model. All children were then posttested using both the same pretest items and a parallel test form to examine the transfer of conservation rule learning to new tasks. The results indicated that the nonconserving children from the modeling group made significant gains on conservation in relation to the control group. As a further indication of the efficacy of observational learning, the authors also found that conserving children who viewed a nonconserving model revealed a significant decrease in conservation judgments when postttested.

Recently, Zimmerman and Blom (1983) used dyadic modeling conditions in order to determine the role played by conflict in children's cognitive development. They conducted a study with preoperational first

graders involving conservation of weight. Two measures of internal conflict were used: a self-report based on the child's judgement of certainty, and response latency. Rule-consistent modeling involved both models indicating agreement of a conserving judgment and rationale for each test item. The findings indicated that "significant acquisition, transfer, and retention of conservation were found for only those children exposed to the least socially conflicting (but rule-consistent) modeling treatment. Neither of the two measures of cognitive conflict predicted acquisition of conservation. The results were interpreted as supportive of a social learning view of cognitive development" (p.18).

Summary

The many studies conducted by Doise and his colleagues have provided compelling evidence that peer conflict generated in the course of social interaction promotes cognitive development. They have also attempted to clarify the conditions under which an interpersonal interaction will produce progress. Mugny et al. (1981) state:

> Essentially, the occurence of a conflict of a social nature is necessary. A socio-cognitive conflict is created when the responses to the same situation differ among the members of a group....The resolution of this conflict can lead to cognitive progress, notably as a function of the intensity and the social significance of this conflict, and providing that it is not resolved by prima facie social processes, such as compliance...or even obedience. Socio-cognitive conflict therefore leads to collective and/or individual cognitive restructuring when these cognitive coordinations are directly involved in the establishment, maintenance or reconstruction of an inter-individual relationship, which itself fits into a larger system of relationships and of social norms.
>
> An inter-individual conflict of this kind involves processes at different levels. Thus, the subject is emotionally activated when he is involved in interpersonal conflict, because of the contradictory responses which are made salient to him. He becomes aware of the

> existence of different centrations, and must come to view his own centration relativistically. We have specified conditions which lead a group member to combine different centrations and to produce new coordinations. This only occurs if the subject is actively involved in the situation. The subject finds himself confronted with cognitive models which, although they do not offer him the correct response, suggest to him some relevant dimensions for a progressive elaboration of a cognitive mechanism new to him (pp. 325-326).

Damon (1981), in reviewing these investigations notes they they are an "important first step towards an experimental paradigm that does justice to the social foundation of cognitive growth. In observing children working through cognitive problems in the course of social interaction, such a paradigm is capable of examining cognition as a process rather than merely as a product; and Doise's approach has also shown that the organizational aspects of cognition need not be overlooked in the study of developmental processes" (p. 166).

Until recently, Doise and his colleagues have focused on demonstrating the importance of the cognitive relationship which exists between partners in order for them to benefit from social interaction. They are now, however, beginning to widen the scope of their investigations to also include the effects of the social relations between partners upon social problem solving. They are currently studying status differences between children and adults (Levy, Doise & Mugny, in press) to determine if cognitive development is affected according to whether the source of the conflict is a peer or an adult.

It seems likely that this line of research will prove fruitful, as the social relation which exists between partners is likely to play an important role in defining the nature of the social situation. It

may be asked, for example, whether other important relations, besides those of adult-child, will effect the course of social interaction and subsequent growth. The proposed study will attempt to determine whether the existence of a friendship relationship between partners of different operatory levels will effect the emergence and resolution of socio-cognitive conflict and consequently, cognitive progress. The following section will describe developmental research pertaining to children's conceptions of friendship in order to make some hypotheses regarding the influence of friendship upon children's behavior in a social problem solving situation.

The Influence of Friendship on Children's Social Interactions

Initial developmental research pertaining to children's reasoning about friendship was based upon a structural approach to social cognitive growth. Children's verbal or written responses to open-ended questions tapping their conceptions of friendship were viewed as an index of their level of social cognitive reasoning abilities. These studies, therefore, focused upon tracing changes with age, with the aim of building stage models based on qualitative differences in children's growing understanding of this particular form of social relationship. The first section of this discussion will briefly describe these investigations. This will be followed by a more indepth description of the few studies which have moved beyond a questioning technique and have examined children's understanding of friendship by observing their actual interactions with friends.

Developmental Investigations of Children's Conceptions of Friendship

One of the earliest studies in this area was conducted by Bigelow and LaGaipa (1975) who found developmental trends in children's reasoning about friendship expectations, defined as those beliefs, attitudes and values that a person expresses as being important characteristics to have in a best friend. These changes with age in responses were tentatively classified into a three-stage scheme: the reward-cost value of friendship, normative expectations, and expectations showing empathy and understanding. Bigelow (1977) conducted further work in this area. He conceptualized friendship as a multi-dimensional cognitive variable and hypothesized that friendship expectations would undergo invariant qualitative changes as a function of socialization. Six to 14 year old children were asked to write an essay about what they wanted or expected their best friend to be like. These essays were content analyzed and 11 friendship expectations were found to increase significantly in a fixed sequence over age. In a cluster analysis of nine of these dimensions, "situational" (e.g. common activities, propinquity), "contractual" (e.g. admiration), and "internal/psychological" (e.g. acceptance, intimacy potential), emerged as sets which fell into the three developmental stages. Additionally, "ego reinforcement" and "reciprocity of liking" were found to account for most of the responses which remained constant over age. These findings suggest that while there are apparent age-related changes in the conceptual basis of friendship expectations, the dimensions "ego reinforcement" and "reciprocity of liking" may transcend these changes in reasoning about friendship. Bigelow concluded that the

cognitive components of friendship appear to change over age while affective ones may be basically stable.

Reisman and Shorr (1978), in a study aimed at determining friendship claims and expectations among children and adults, found that four friendship expectations dimension showed a developmental progression. "Common activities", "loyalty-commitment", and "intimacy potential" increased with age, whereas "play" decreased with increasing age.

Studies investigating the cognitive bases for liking and disliking peers (Hayes, 1978; Scarlett, Press & Crockett, 1971) also found qualitative changes with age in children's descriptions of those beliefs, attitudes, values and behaviors deemed as important characteristics to have in a friend.

Selman (1976) has examined children's descriptions of friendship with these conceptions interpreted as being a reflection of the child's underlying perspective-taking ability. He has devised a five level invariant-sequence model of social perspective-taking, contending that "social perspective-taking...is the basic structural component of reasoning about social categories of experience, particularly reasoning about interpersonal relations" (pp. 158-159).

Youniss (1975; 1976; 1978; Youniss & Volpe, 1978) has developed a 'relational' approach based on Piaget (1932) and Sullivan (1953), founded on the premise that an understanding of interpersonal relations - and not perspective-taking ability per se - underlies social cognition. Youniss and Volpe (1978) write: "interactions grounded in reciprocity lead to shared knowledge. Peers actually coconstruct rules and procedures, which become the gist of their relation. Mutuality is first practiced,

then reconstituted into principles, and then put back into social practice. In other words, peers jointly create the perspectives that they both share" (p. 18). They believe that psychological understanding of one's relation to another person is not abstractly separated from one's knowing how to interact with the other person. Like Selman (1976), they have also developed a sequential model, but theirs is based on age-related changes in children's conceptions of friendship interactions. They contend that self and other comprise a basic unit regarding which children's understanding of friendship relations develops from interactive rules to procedures and eventually into systems of relations.

Selman and Youiss have sought to explain qualitative changes in children's understanding of friendship in terms of the underlying conceptual achievements which they are taken to represent. Damon (1977) has synthesized their respective approaches and findings, and proposes that children's developing friendship knowledge evidences qualitative changes with age described by a three level model.

Damon states that while children at all ages describe friendship as a relation between peers characterized by mutual affection, the conceptual basis, means for affirming, and reasons for terminating this relationship of 'mutual liking' undergo an age-related progression. At level 1 friends are described as associates with whom one plays or has frequent contact. The affirmation of the relation is by sharing material goods. At this initial level neither child has an understanding of the other's personality. Termination can be brought about by the negative or hostile actions of one child toward the other. Relations are fluid, with friendships quickly forming and terminating. At level 2

friendships are characterized by reciprocity. Children now assist one another and each child responds to the other's needs. Reciprocal trust becomes a fundamental concept in the relation. Termination is likely to occur when one child acts in a manner at odds with the self-interests of the other. Friendships are no longer considered to be based upon the sharing of goods but more so on one's subjective experience of the other's personal character traits, e.g. the friend being kind, trustworthy, etc. At the most advanced level, the focus is upon the sharing of intimate feelings, secrets and ideas. The psychological well being of the other is important to each child and what is done is centered upon providing psychological comfort. Friendships are conceived as long lasting relations in which caring for the other's needs (psychological) as well as the mutual sharing of inner thoughts become an affirmation of the relation. Friendship terminates when, over a long period of time, mutuality of concern is no longer felt to exist.

Investigations of Children's Interactions with Friends

The above cited investigations highlight the fact that sharing, and later the offering of concrete and psychological forms of assistance (e.g. offering comfort, understanding, etc.) are salient characteristics of children's friendship conceptions which serve to express the mutual liking upon which friendship relations are based. It is not surprising, therefore, that recent studies pertaining to children's actual interactions with friends have examined their behavior in social settings which provide them with the opportunity to share and offer each other assistance.

One of the earliest studies to investigate children's actual

sharing behavior was conducted by Staub and Sherk (1970). Pairs of 4th grade children were selected to examine the relation between candy sharing by one child (the giver) with another child (the receiver) and the subsequent sharing of a crayon by the latter with the former. About half of the sample consisted of mutual pairs (both the giver and receiver had reported liking each other), the other half consisted of nonmutual pairs (the giver reported liking the receiver, but the receiver had not indicated liking the giver). Results indicated that overall, crayon sharing was positively related to the number of candies the receiver was given. The givers who ate candy in the other child's presence but shared none of it, received the crayon for very short times only, if at all. Receivers in mutual pairs, however, shared the crayon for significantly longer periods of time then did nonmutual pairs, regardless of their partner's prior candy sharing behavior. The authors concluded that among friends, prior experience with each other and expectations that develop out of these experiences may have reduced or modified the receiver's perception of the fairness or generosity of the giver's behavior. These findings can also be viewed as suggestive that friends are more sensitive to each other's desires.

Newcomb, Brady and Hartup (1979) observed pairs of children, composed of either friends or acquaintances, engaged in a social situation. Their study assessed the influence of friendship and incentive condition on task performance and social interaction. First and third grade children, together with either a friend or acquaintance, were given a block building task. Children's performances were rewarded sequentially: phase 1 - shared rewards, phase 2 - "winner take all"

or proportional rewards, and phase 3 - shared rewards.

Results indicated that friendship facilitated the expressive and reciprocal components of social interaction regardless of reward condition. Specifically, friends showed more affect toward one another than acquaintances, more teasing as well as more laughing (see Foot, Chapman, & Smith, 1977). The social interaction between friends was also marked by mutually directed guidance and suggestions, which tended to elicit compliance. Individualistic commands were more frequent in the interactions of acquaintances and elicited more noncompliance. However, friends and acquaintances did not differ in terms of their performance outcomes, even under those conditions when the reward structure encouraged competition.

Berndt (1981a) attempted to examine whether children who are friends share and help one another more than children who are not good friends. Kindergarten, second- and fourth- grade children were paired with either a close friend or with an acquaintance (a classmate they neither strongly liked or disliked). In a separate interview, they were individually asked how they intended to behave toward this particular child in specific situations where they could share with or help their partner. For each hypothetical situation (e.g. sharing toys at recess, helping the partner clean the classroom), they were also asked what they thought they should do, what their partner expected them to do, and what they really wanted to do. The results from this aspect of the study indicated that for both friends and acquaintances, children reported they would share and help about as much as they wanted to and felt they should, but less than they believed their partner expected them to.

It was also found that girls said they would share and help a friend more than an acquaintance. Boys said they would treat friends and acquaintances in a similar manner. Berndt, interpretating these results writes: "The sex difference may be related to previous evidence on the greater intimacy and exclusiveness of girls' friendships. If a girl has a close friendship with only one other girl, she is likely to behave in an especially positive way to her friend not only to keep the friendship, but also because she can afford to go out of her way for a single other person. In contrast, a boy who has many friends need not be as careful about promising to share with and help a friend, because all his friends demand the same treatment" (p. 641).

In a second, interactive situation, the pairs of friends and acquaintances were observed as they performed two tasks. One task involved helping the partner or working on one's own activitiy and no significant effects of grade, sex or friendship were found. The other task was adapted from Staub and Sherk (1970) and required that each child work on color-by-number designs, where there was only one crayon of each color. Children were told that they could determine how well they were doing by the amounts of nickels which would be placed in their respective cups after each trial. The rewards were arranged so that on each trial, one child received one nickel while the other received two nickels. While this did not create a situation of "winner take all", rewards proportional to work performed was intended to create a competitive atmosphere. If the children shared for a longer time, they had less time to color their own design and so were likely to get fewer nickels.

Sex differences were also found on this aspect of the study. Evidence from several measures indicated that boys actually behaved less prosocially towards friends than towards acquaintances. In some cases, second and fourth grade boys shared significantly less with friends than with acquaintances. Across all three age groups, boys' requests for crayons tended to be less successful with friends than with acquaintances. Moreover, for boys the difference in the amounts colored by the two partners was greater for friends than for acquaintances. Friend-acquaintance differences among these measures was not significant for girls.

Berndt (1981a), in describing these findings writes:

> The results can be explained in terms of an interaction between greater competitiveness in boys and greater spontaneity in the social interactions of friends. The task was structured so that children who shared the crayon for a long period of time were likely to get fewer rewards than their partner. Research...has indicated that relative loss, or getting less than one's partner, is especially disturbing to boys; relative gain, or getting more than one's partner, is especially satisfying to them.... When tasks are not competitively structured, friends' interactions appear to be more spontaneous, informal, harmonious, and mutually responsive than those of strangers or acquintances. These characteristics should lead to more prosocial behavior between friends than acquaintances. However, when boys' competitiveness is engaged by competitively structured tasks, the greater spontaneity of friends' interactions contributes to greater competition and less equal sharing (p. 641).

Berndt (1981b) conducted a longitudinal study with first and fourth grade children. The first aspect of this research was similar in focus to the above cited study (Berndt, 1981a). It entailed an examination of age changes both in children's stated intentions to share and help

a friend and in their actual sharing behavior. Berndt noted that his previous study (1981a) indicated boys' greater competitiveness towards friends under conditions of unequal rewards. In this study Berndt (1981b) hypothesized that a different pattern might be expected on tasks in which children have the option of getting the same rewards as their partner obtains. "Friends may favor equal outcomes more than competition because they view their partner personally rather than in the role of an opponent and because they regard themselves and their friends as teammates....The preference for equality would be expected to increase with age if children increasingly seek outcomes satisfying to themselves and to their friends" (p. 409).

The second purpose of the study was to determine how particular friendships changed over time; how intentions and behavior for specific pairs of friends changed during the course of a school year. The procedures were similar to those employed in his previous study. The children were interviewed and observed as they performed tasks that allowed them to determine whether they would obtain equal or unequal rewards. All the procedures were repeated five months later.

In both the fall and spring, age changes were found that suggested an increase in compromise or mutual accommodation between friends. Berndt found that fourth graders not only showed more prosocial intentions and prosocial behavior toward their friends than first graders did, they also assumed that their friends would expect a more moderate amount of prosocial behavior and would be satisfied with their decisions about how much to share and help. Changes in intentions and behavior between fall and spring were significant only for first graders.

First graders' intentions to share and their actual sharing behavior decreased over time. The changes were said to reflect less stability in younger children's friendships and relations among strength of friendship, prosocial intentions and prosocial behavior.

Sharabany and Hertz-Lazarowitz (1981) sought to determine whether friends share and communicate more in a non-competitive, naturalistic setting. Kindergarten and first grade children were paired with either a friend or non-friend (acquaintance) and asked to draw on a single sheet of paper. They found that friends exhibited less sharing and communicative behaviors, but more task activity. Non-friends, on the other hand, minimized task relevant behaviors and maximized social communicative behaviors. They concluded friends greater familarity with each other and prior experiences together resulted in their exhibiting behaviors most relevant to attaining the goal of the task. Since non-friends were not as familiar with each other, they needed to spend time engaging in explorative behaviors such as looks, talks and exchanging materials in order to establish familiarity and procedures for working together.

Sex Differences in Children's Game Playing Behavior

Studies of children's game-playing behavior sheds light on important sex differences which have been found during middle childhood. Gilligan (1982) in reviewing these studies notes that: "Children's games are considered by George Herbert Mead (1934) and Jean Piaget (1932) as the crucible of social development during the school years. In games, children learn to take the role of the other and come to see themselves through another's eyes. In games, they learn respect for

rules and to come to understand the ways rules can be made and changed" (p. 9).

Lever (1976) examined 181 fifth-grade, white, middle-class children, observing the organization and structure of their playtime activities. The children were observed at play during school recess and in physical education classes. They were also asked to keep diaries concerning how they spent their time outside of school. The following sex differences were found: boys play out of doors more often than girls do; boys play more often in large and age-heterogeneous groups; they play competitive games more often, and their games last longer than girls' games. Gilligan (1982), in reviewing these findings writes that:

> The last is in some ways most interesting. Boys' games appeared to last longer not only because they required a higher level of skill and were thus less likely to become boring, but also because, when disputes arose in the course of a game, boys were able to resolve the disputes more effectively than girls: "During the course of this study, boys were seen quarrelling all the time, but not once was a game terminated because of a quarrel and no game was interrupted for more than seven minutes. In the gravest debates, the final word was always, to 'repeat the play', generally followed by a chorus of 'cheater's proof'" (p. 482). In fact, it seemed that the boys enjoyed the legal debates as much as they did the game itself, and even marginal players of lesser size and skill participated equally in these recurrent squabbles. In contrast, the eruption of disputes among girls tended to end the game (p.9).

Lever 1976) concludes that from the games they play, boys learn both the independence and organizational skills which are required for coordinating the activities of large and heterogeneous groups of individuals. By participating in rule-oriented and socially approved competitive activities, they learn to deal with competition in a

relatively forthright manner. Girls' play, on the other hand, tends to occur in smaller, more intimate groups, often the best-friend dyad, and in private places. This play replicates the social pattern of primary human relationships in that its organization is more cooperative. Gilligan (1982) speaking to these findings about girls' play notes: "Thus, it points less, in Mead's terms, toward learning to take the role of "the generalized other," less toward the abstraction of human relationships. But it fosters the development of empathy and sensitivity necessary for taking the role of "the particular other" and points more toward knowing the other as different from the self" (p. 11).

One of the consequences of these differences in socialization, which has been documented by Gilligan (1982), is that girls are reluctant to judge others' behavior. She writes: "The reluctance to judge may itself be indicative of the care and concern for others that influence the psychology of women's development..." (p. 16). Later, she goes on to add: "The reluctance to judge remains a reluctance to hurt, but one that stems not from a sense of personal vulnerability but from a recognition of the limitation of judgment itself" (p. 102). These differences in attitudes leads Gilligan to conclude that "boys in their games are more concerned with rules while girls are more concerned with relationships, often at the expense of the game itself..." (p. 16).

Summary

To date, all investivations pertaining to social interactions among friends have examined exchange behaviors (giving, taking and helping) and, to a lesser extent, communicative behavior. Some, but

not all studies, have found significant differences between friends and acquaintances, and sex-by-partner interactions, within some of these measures. The equivocal nature of the findings is due, in large measure, to such experimental dimensions as the tasks' goals and purposes (e.g. competitive vs. non-competitive), the ages chosen for study, the degree of commonality in the means which are to be used (e.g. equal or unequal ownership of material), and the presence and nature of an external reward for performances.

As can be seen, there have been no investigations with the aim of examining the influence of friendship upon children's working together on cognitively challenging tasks. It is therefore difficult to attempt to extrapolate specific hypotheses based on sharing studies because of the important differences in the nature and structure of these experimental paradigms and those used for studies focusing on the effects of socio-cognitive conflict and cognitive growth. The two studies (Berndt, 1981a; Newcomb, Brady & Hartup, 1979) which employed competitive tasks structures may be viewed as having created conditions for the arousal of 'conflict' between the partners. However, this is a type of 'conflict' based on the children's awareness that there will be an unequal distribution of external rewards for individual performances. This is quite different in nature from a 'socio-cognitive conflict' which emerges when children with different approaches to cognitive reasoning tasks become aware of these differences or the contradictory nature of their responses.

Despite these difficulties, the existent research on children's conceptions of friendship, their behavior with friends, and their game playing behavior does provide a minimal base for the positing of some

tentative ideas about how friendship may influence the course of social problem solving. One important area which deserves further study concerns sex differences in the effects of friendship. While sex differences in friendship conceptions and behaviors have not been consistently found, when they do occur, they usually indicate girls' greater concern with the intimacy of the friendship and the friend's faithfulness. In addition to the findings obtained by Berndt (1981a) there is also further evidence (see Benton, 1971; Gilligan, 1982; Macoby & Jacklin, 1974) which indicates that friendships are more differentiated from other relationships in girls than in boys. Girls' friendships appear to be more exclusive while boys' friendships appear to be more inclusive and often involve a group of children (see Damico, 1975; Eder & Hallinan, 1978; Lever, 1976; Macoby & Jacklin, 1974). Furthermore, based on the findings obtained by Lever (1976), there is reason to speculate that girls may avoid making critical judgments towards their friends' work and may therefore not fully grapple with differences which may emerge in their respective attempts at solving cognitive reasoning tasks.

Chapter 2

Statement of the Problem

This study had two main purposes. The first was to determine whether a relationship existed between the amount of change children made during social problem solving and the extent of subsequent individual progress. In accordance with a socio-cognitive conflict model of development, it was anticipated that not only the less advanced, but even the more advanced member of the pair would make cognitive progress as a result of the modification and coordination of their activities. In other words, children of different reasoning levels who worked together on a cognitively challenging task, and recognized and attempted to reconcile their differences, were expected to make significantly greater gains than children who worked together but failed to recognize and/or reconcile differences in their problem solving approaches.

Studies of social interaction and cognitive growth have generally used Piagetian tasks involving conservation (Inhelder, Sinclair & Bovet, 1974; Murray, 1972) or spatial perspective-taking (Bearison, 1983; Doise, Mugny, Perret-Clermont, 1975; Mugny & Doise, 1978). The latter tasks have certain advantages over those based on verbal responses. Any individual gains cannot be attributed to the less advanced child's having merely memorized the correct verbal response. Also, spatial tasks, using the construction response, rely more on task directed activities and less on verbal reasoning. These types of tasks encourage children to directly act on the task materials and their reasoning abilities are reflected in their physical manipulation of the materials. A spatial task developed by Flavell, Botkin, Fry,

Wright and Jarvis (1968) was chosen for this study, in part, due to the consideration just noted. It was also chosen because it was anticipated that the children would find it enjoyable, and that it would hold their interest. Lastly, based on results obtained by Flavell et al. (1968) and Rubin (1973), it was expected that the children's performances on this task would yield the necessary range of scores.

The second purpose of this study was to examine the influence of friendship upon the nature and course of social problem solving. Fifth grade children were chosen for this study because previous investigations of age-related changes in children's conceptions of friendship provided evidence that, in general, children of this age/grade level have a fairly consistent and mature working understanding of friendship. That is, they describe friendship as a reciprocal relationship based upon assisting and responding to each other's needs. Furthermore, the subjective experience of personal characteristics also plays an important role in the formation and maintenance of friendships, i.e., friends are chosen and kept on the basis of their being kind, trustworthy, etc. As there have been no prior studies in this particular area, tentative hypotheses were based on findings pertaining to preadolescents' conceptions of friendship, sharing behavior among friends, game playing behavior, and the pilot data.

Evidence has previously been cited (Berndt, 1981b), which suggested that there may be differences in boys' behavior on non-competitive tasks, depending on whether they work with a friend or an acquaintance. Male friends who work together may view each other as 'teammates' or 'collaborators'. With regards to a non-competitive but cognitively challenging task, their work together may be expected to be focused

upon the implicit goal of the task, i.e., to reconcile their differences in response strategies. Male non-friends, on the other hand, may not feel such a strong need to fully 'trash out' the differences in their reasoning and arrangements, and/or may simply discount at least some aspects of what the partner says or does. If this premise held true, male friends were expected to evidence more cognitive growth than male non-friends.

A quite different pattern, however, may be expected to emerge between girls who are close friends and girls who are 'merely' acquaintances. It is possible that girls' greater concern about intimacy (e.g., their friends' feelings), and with loyalty and faithfulness, could create a situation where the maintenance of a 'conflict-free' friendship relation takes precedence over the recognition and/or reconciliation of observable conflicts which emerge as a result of their different and noncompatible responses. It was therefore expected that girls who are friends would evidence a tendency toward ignoring or denying the recognition of existing differences in their solutions to cognitive reasoning tasks. Furthermore, should one or both girls have indicated an awareness of differences, it was anticipated that they would fail to engage in relevant activity towards reconciling these differences, in order to maintain a harmonious friendship relation. It is impossible to reconcile differences if they are not recognized in the first place. If differences are recognized, but the girl is unwilling to take the risk of telling her best or close friend that she thinks she is 'wrong', and engaging in discussions and manipulations of the objects to demonstrate her reasoning, no reconciliation of differences can take place.

Consequently, no significant cognitive progress should occur.

Girls who are acquaintances, on the other hand, do not have to concern themselves with such important interpersonal issues. They should, therefore, recognize differences between their own and their partner's approach to a cognitive reasoning task and work toward a reconciliation of these differences. Consequently, girls who are acquaintances should evidence more cognitive progress than that obtained by girls who are friends.

The findings of the pilot study, which consisted of four friendship dyads (4 males and 4 females) and four non-friend dyads (4 males and 4 females), also provided support for these suppositions.

Hypotheses

With regard to the objectives of the present study, the following hypotheses were formulated. The second and third hypotheses are based on cited theoretical formulations and empirical findings which suggest that the extent of conflicts and coordinations during the social situation may be influenced by an interaction between the partners' sex and social relationship.

Hypothesis 1

There will be a strong, positive relationship between those children who demonstrate the greatest amount of change during social problem solving, and the extent of individual progress these children later evidence when working alone on these same types of spatial reasoning tasks.

Hypothesis 2

Males from friendship dyads will make significantly greater gains than males from non-friend dyads.

Hypothesis 3

Females from non-friend dyads will make significantly greater gains than females from friendship dyads.

Chapter 3

Method

Subjects

The sample consisted of 64 fifth graders (32 females, 32 males). The mean chronological age of the students was 10.7 years. They were selected from two predominantly middle class schools in New York City during the Spring of 1983, to ensure time for the formation of peer relationships. One of the schools was a public elementary school and the other was a parochial school. Both schools had similar ethnic compositions. About 75 percent of the students were caucasian, while the other 25 percent were of black, Hispanic or Oriental descent. All students who participated in this study were fluent in English.

Measures

A spatial perspective-taking task developed by Flavell et al. (1968) was employed. The task was to reproduce each of four displays, with duplicate materials, from the experimenter's viewpoint. The child was seated directly across and opposite from the experimenter and the model displays. The elements of each display were fastened to an 8½" x 11" wooden board to keep their spatial interrelationships constant. The elements of each display (see Figure 1) are described below:

Display 1: a single blue colored block of wood 6" long and 1" thick. It is 6" high at one end and 4" high at the other. Thus its upper edge is diagonal rather than parallel to the board. As Figure 1 shows, it was always placed so that its higher side (H) was on each of the children's right and its lower side (L) on their left, as they faced the model.

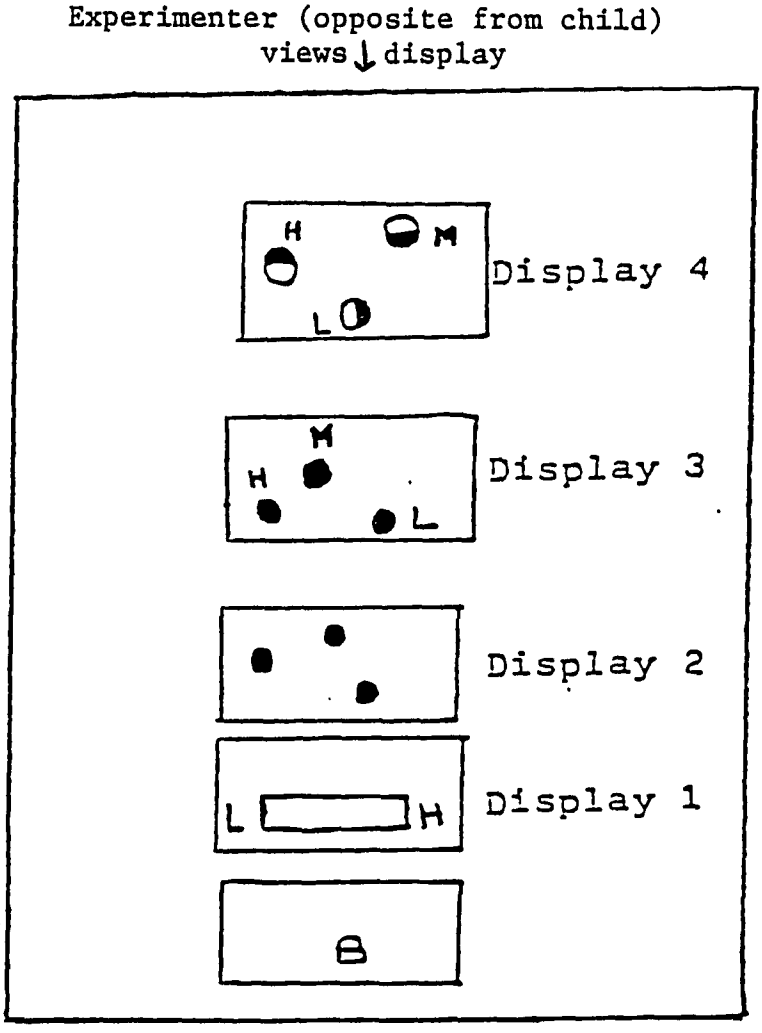

Figure 1. The experimental situation, viewed from above. Each display is presented separately. (Adapted from Flavell et al., 1968, p.56).

Display 2: three identical blue wooden cylinders, 4" high and 1" in diameter, standing on end in the spatial arrangement shown in Figure 1.

Display 3: three blue wooden cylinders, one inch in diameter. Their heights are 6" (H), 4" (M), and 2" (L).

Display 4: three cylinders identical in size to those of Display 3. However, each is painted red for half it circumference (including the top and bottom - see Figure 1), and white for the other half.

This set of materials will henceforth be referred to as Form A. Another set of displays and duplicate materials, Form B, was employed for the posttest. Form B was identical to Form A, aside for a difference in color. Specifically, blocks which were blue in Form A were red in Form B. For Display 4, Form B consisted of blue and white cylinders.

As in the original study by Flavell et al. (1968) and a replication by Rubin (1973), the displays were presented one at a time, always in sequence (1 through 4). Each succeeding display places an additional demand on the child by adding a new feature that needs to be taken into account in order to reproduce the experimenter's perspective.

Display 1 requires a left/right inversion due to the 180° difference between the experimenter's and the child's view of the experimenter's wedge. Display 2 requires that the three cylinders be placed in the proper front/back position and at the correct distance relative to the others. Any cylinder, however, could occupy any position in the configuration, since they are all identical. Display 3 places an additional demand on the child in that the cylinders are of different heights so each can only occupy one particular position (with regards to left/right and front/back dimensions) in the configuration. Display 4

includes all preceding requirements and adds one more. Each cylinder has to be placed, within its proper left/right, front/back position, in such a way that it has one specific appearance in terms of color. For example, the tallest block (H) must be placed so that the red side faces the child, and the shortest block (L), so that the red side is on the child's left and the white side on the child's right.

The scoring system, derived from Flavell et al. (1968, pp. 59-60) is as follows:

The annotated tracings of the child's arrangements were compared against a standard, a thin translucent sheet of paper with the exact arrangements of the elements traced on it. For Display 1, the maximum score of 3 was given when the configuration was correct on the first attempt. A score of 2 was alloted if it was incorrect on the first attempt, but correct on the second attempt (that is, after the child went over to look from the experimenter's position). A score of 0 was given if the arrangement was incorrect on the first attempt and the second arrangement was the egocentric, child-perspective one. A score of 1 was given if incorrect on the first attempt, and the second attempt was any other incorrect one.

For Display 2, the maximum score of 4 was given if the configuration was correct. A score of 3 was allotted if the arrangement was minimally correct, that is, the configuration was simply, and barely, more similar to the experimenter's view than what would be seen from the other three positions. A score of 2 was given for a 90° perspective arrangement. A score of 1 was given for a miscellaneous arrangements, and a score of 0 for an egocentric one.

For Display 3, the maximum score of 5 was given if the configuration and height were correct. A score of 4 was given if the configuration was correct, the L cylinder properly placed, but the M and H cylinders were incorrectly placed (relative to each other) on either the front/back or left/right (or both) dimensions. A score of 3 was given if the configuration was correct but the height was "more incorrect" (L too close to M and H) than to deserve a score of 4. A score of 2 was given if the configuration was incorrect but the height was correct or partly correct (that is, correct ordering on either the right/left or front/back dimensions, but not both). A score of 1 was given for a miscellaneous arrangement, and a score of 0 for an egocentric arrangement (both in configuration and height).

For Display 4, the maximum score of 6 was given if the configuration and color were correct, and the height at least partially correct. A score of 5 was given if the configuration was correct, and the height at least partly correct, but the color was only partly correct (i.e., only two of the three cylinders properly oriented as regards color). A score of 4 was given if the configuration was correct and either height or color (not both) were at least partly correct. A score of 3 was given for either of the following: (a) the configuration was correct, but neither height nor color were even partly correct, (b) the configuration was correct, but either the height or color (not both) was at least partly correct. A score of 1 was given for a miscellaneous arrangement, and a score of 0 for an egocentric one (in configuration, height and color).

The total number of points a child could obtain ranged from 0-18.

Flavell et al. (1968) write: "Despite its apparent complexity, the scoring system turned out to be fairly easy to use after a little practice, and its interjudge reliability was highly satisfactory: the product moment correlation between two sets of total scores was .98, with 91 percent of the Ss actually being assigned the same scores by both judges" (p. 61).

Procedure

Pretest and Formation of Groups

All children were individually pretested on Form A of the spatial perspective-taking task described above. The experimenter escorted the child into the room and sat him or her at the table (see Figure 2). The experimenter then sat down across from the child at the opposite side of the table. Display 1 was already in its proper orientation at position A. An 8½" x 11" wooden board with a sheet of same-sized paper, and a duplicate block flat to the child's left side was on the table at position B. The following instructions were given:

> "_____(child's name), I'm going to ask you to play a game with blocks today that I think you'll find interesting. I'd like you to listen to the instructions carefully. When I've finished, I'd like you to say them back to me - in your own words - before you actually play the game.
>
> I want you to take your block (indicate) and put it on the paper (indicate) so that it looks to you, there just like my block looks to me here. OK? Now tell me what you're supposed to do."

The vast majority of children had no difficulty comprehending and paraphrasing the instructions. In the few cases where they experienced difficulty in expressing the instructions, they were repeated. The child was then told: "you can go ahead and do it now. Tell me when you've finished." If the child arranged the block incorrectly, this was recorded and he/she was told to "come over (to the experimenter's

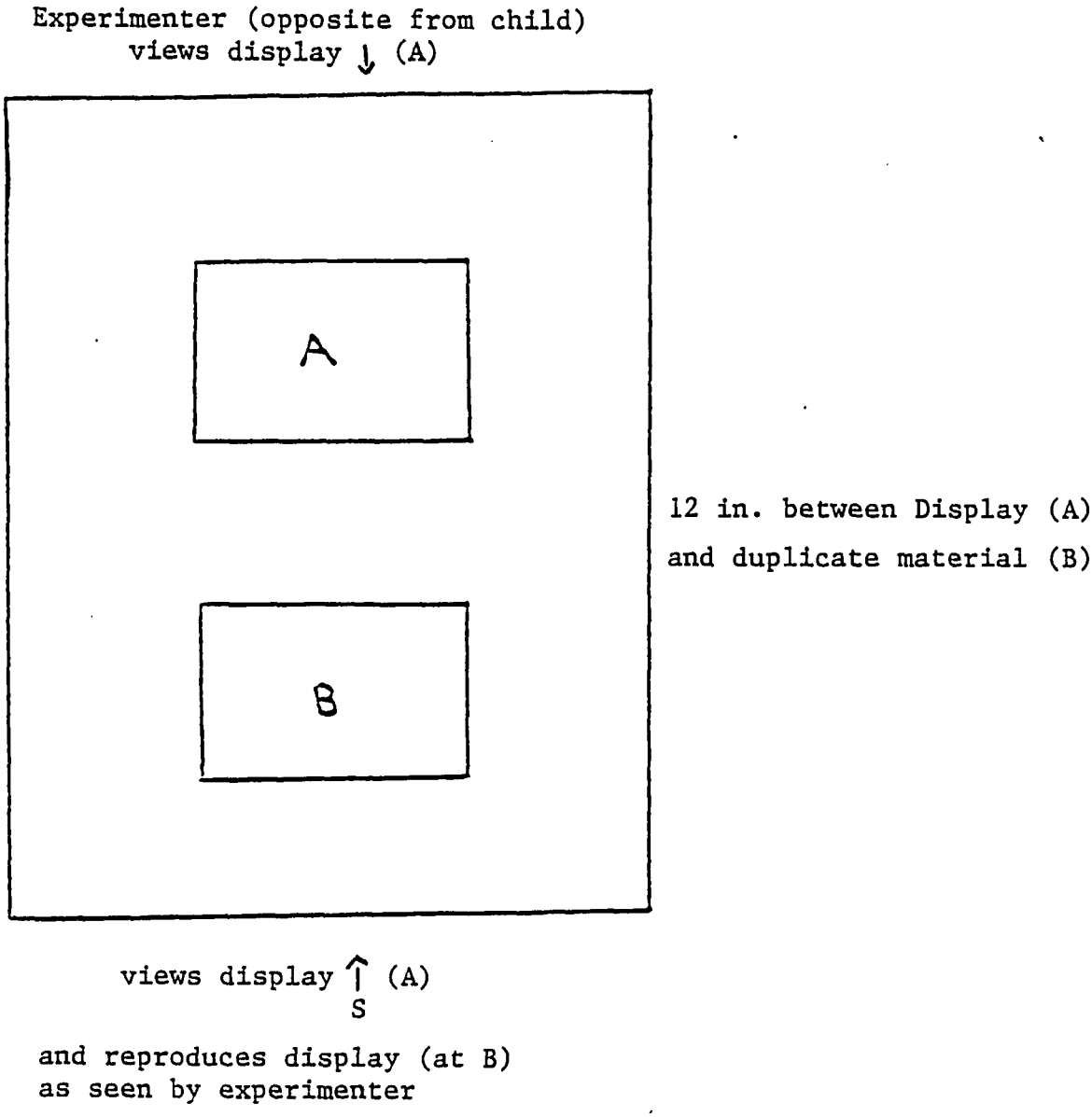

Figure 2. The pretest and posttest experimental situation.

side) and see how I see my block from over here." Upon returning, the child was permitted to modify his/her original arrangement. As per the procedures used by Flavell et al. (1968), Display 1 was the only case where the child was given a chance to move to the experimenter's position and to attempt a second arrangement.

Before presenting Display 2 and the duplicate materials, the experimenter traced the child's final arrangement and made all necessary notations. All subsequent displays and duplicate materials were presented in a similar manner. The preassembled display was placed in its proper orientation at position A. Paper was placed on the board, and the duplicate material was placed flat down on the child's left side, at position B. The experimenter traced around each element and made other notations regarding position, height and color. The instructions, "put your blocks so that they look to you, there, just like..." were repeated for each display except in cases when it was obvious that the child had not forgotten what was supposed to be done.

Children who obtained scores from 0-2 were classified as Non-Compensators (NC) and those who obtained scores from 7-14 were classified as Partial Compensators (PC). These classificatory terms are derived from Mugny and Doise (1978) who developed this classification system to identify the degree to which children were aware of and could compensate for differences in spatial orientations. In this study, children must compensate for the 180° difference in orientation between their own and the experimenter's position vis-a-vis the model displays.

At the conclusion of the pretest, children were asked to name the same-sexed best friend and two other close friends who were in their class or in another fifth grade class. They were also asked to name

the same-sexed fifth grader they liked the least, so that non-friends dyads would not be composed of "enemies".

Children were matched into friendship pairs by first choosing most mutual choices, provided that these dyads consisted of a NC and PC. In order to ensure that there were considerable ability differences between pairs of PC's and NC's, children were only paired if there was a minimum of a six point difference between their respective pretest scores. For example, a NC with a pretest score of 2 could not be paired with a PC who earned a pretest score of 7; a NC with a pretest score of 1 could be paired with a PC who obtained a score of 7. In cases where children could not be paired according to mutual first choices, the friendship list was followed downward (first choice with second choice, and second with second) until the spatial perspective-taking differences criteria was met. To maximize the possible influence of friendship, no children were paired with less than their mutual second choices. These 32 children, consisting of 16 males (eight NC's with eight PC's) and 16 female (eight NC's with eight PC's) friendship dyads constituted the Friendship Group.

Non-friends were selected after the completion of the list of friends, defined as pairs as children who did not appear on each other's list of three close friends or the least liked peer and who met the spatial task scoring difference criteria. Additionally, in all cases, these pairs consisted of children who were not from the same class. These 32 children, consisting of 16 females (eight NC's with 8 PC's) and 16 males (eight NC's with eight PC's) non-friend dyads constituted the Non-Friend Group.

Social Problem Solving Situation

Approximately three weeks after pretesting, dyads from both groups were presented with the same four displays (Form A) used during pretesting. The children were brought into the room together and seated side-by-side at the table (see Figure 3). The experimenter sat opposite them at the center of her side of the table. Display 1 was on the table in its proper orientation at position A. Duplicate blocks were laying flat down on the left side of the children's respective boards at position B and C. The screens were on the floor near the experimenter when not in use. Screen x was used to prevent each child from seeing what the other was doing. The children were given the following instructions:

> "_____ and _____ (children's names), remember the games you played here a few weeks ago? I'm going to ask you to play them again today. Remember the instructions? I want each of you to place your blocks on the paper so that they look to you there, the way that mine looks to me, here. OK?
>
> After you've both finished, I'll remove this screen (indicating portable screen x) that I'm going to put up between you. Then you'll be able to see and talk about where you've placed the blocks.
>
> Now I'm going to put up the screen (x). Remember, put your block on your paper so that it looks to you there just like my block looks to me from here. OK? Tell me when you've finished."

To ensure consistency in experimental procedures among all dyads, after both children arranged Display 1, they were requested to walk over to the experimenter's side of the table. They were told: I'd like you both to come over to my side of the table so that you can see how I see my block from over here." Before they did so, however, their arrangements were recorded and a screen (y) was placed in a

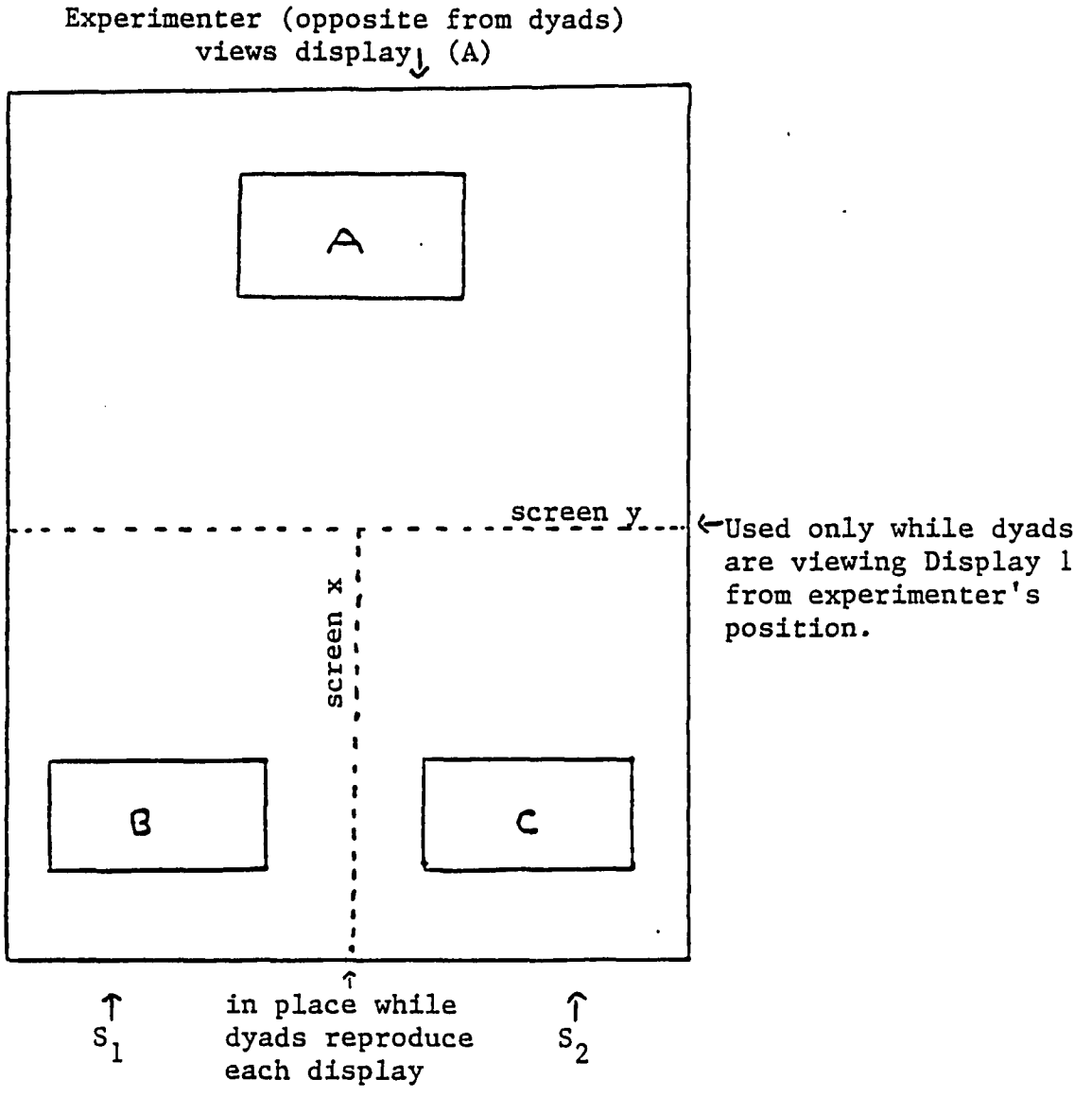

Figure 3. Experimental situation for social problem solving phase.

lateral position across the table. This screen blocked their view of their arrangements while they were looking at Display 1 from the experimenter's position (see Figure 3). As in the pretest, Display 1 was the only case where the children were permitted to view the display from the experimenter's position and attempt a second arrangement.

When the children returned to their seats screen y was removed (screen x remained in place). They were told that they could change the placement of their block if they wanted to. After both children reported being satisfied with their respective precomparison arrangements, the elements were traced in blue colored ink before screen x was removed. As the experimenter was removing the screen she said: "OK, now you'll be able to see and talk about where you've placed the blocks. You can do whatever you wish with the blocks." Only a few of the children appeared initially hesitant and/or reticent and the experimenter encouraged interaction by asking such questions as "what do you think?" She did not, however, provide information or reinforcement for correct or incorrect responses or arrangements.

The children were permitted to handle their own and each other's materials. They were also permitted to rotate their boards and/or the experimenter's. The examiner noted the occurence of such behaviors. No dyads rotated their own boards, although two pairs (one female non-friend, and one male friendship dyad) rotated the examiner's board. In both cases, this occured after they had already discussed their respective arrangements and made modifications, in order to 'check' their arrangements. In one case, the female friendship pair, both arrangements were basically correct, but the partners modified their arrangements slightly (i.e.,

moving one or two blocks by less than one inch) so that they would be 'perfect'. The dyads were not, however, permitted to come over to the experimenter's side of the table.

When either or both children modified their arrangements, these postcomparison arrangements were traced in red ink before the next display and the duplicate materials were presented, and screen x was replaced.

Posttest

Approximately three weeks after the dyads engaged in social problem solving, all children were individually posttested on Form B. The experimental situation (see Figure 2) and instructions were similar to that used for pretesting. The child was escorted into the room, seated at the table and given the following instructions:

> " _____(child's name), I'm going to be asking you to play this game again for the last time. As you can see, it looks a bit different from the one you played before. The instructions are the same, though. I want you to take your block and put it on the paper so that it looks to you there, just like my block looks to me here. OK? Tell me when you've finished."

As in the pretest condition, but unlike the social problem solving situation, the children were only permitted to view Display 1 from the experimenter's position, and make a second attempt, if their initial arrangements were incorrect.

Chapter 4

Results

The results are presented in three sections. The first, initial considerations, includes information about the pretest findings. The last two sections cover findings pertaining to social interaction and growth, and the influence of friendship, respectively.

Initial Considerations

Interrater Reliability

Interrater reliability was obtained on pretest scores for the spatial task. Twelve sets of the display array tracings were randomly selected as samples. The present experimenter and a research assistant served as raters. Pearson correlations were employed to determine reliability. The correlation between the two judges' ratings on the total scores was $r(10) = .97$, $p < .01$.

Pretest Findings

A total of 126 children were pretested. Due to the criteria which had to be met for inclusion in this study, compensation level (0-2 or 7-14) and friendship choices, 62 children who were initially pretested were not included in this study.

A total of 74 males were pretested and obtained a mean spatial pretest score of 5.8 (S.D. = 5.1); one male obtained the maximum score of 18. A total of 52 females were pretested and obtained a mean spatial pretest score of 6.4 (S.D. = 5.5); two females obtained the maximum score. A t test was performed comparing the males' and females' pretest scores, t (1, 124) = .061, $p > .05$, indicating that there was no statistically significant difference between the sexes.

The three independent variables were: 1) friendship status (pairing with either a friend or a non-friend), 2) sex (male or female), 3) compensation level (NC, NonCompensator, or PC, Partial Compensator).

A 2 x 2 x 2 (Friendship status by Sex by Compensation Level) analysis of covariance was conducted on each of seven dependent variables. The pretest scores were the covariate. The dependent measures included the scores on three phases of the experiment: pre-comparison, post-comparison, and posttest. Change measures, generated from these scores, were also used to determine the extent of cognitive gain made before, during and after the comparison phase of the experiment. Four sets of change measures were examined:

Change 1: Pre-comparison minus pretest scores. Measured the effects of joint verbal and physical activity upon subsequent individual problem solving efforts. A positive score indicated that social interaction on prior displays positively influenced independent problem solving efforts on subsequent displays.

Change 2: Post-comparison minus pre-comparison scores. Measured the overall effects of inter-individual conflicts and coordinations, and the extent to which the children reconciled differences in their respective displays.

Change 3: Posttest minus post-comparison scores. Measured the extent to which the coordinations which emerged during social problem solving had been internalized by each child.

Change 4: Posttest minus pretest scores. Measured the extent of overall individual gain made as a result of the inter-individual conflicts and

coordinations which occured during the course of social problem solving.

The means and standard deviations for the independent and dependent variables are presented in Tables 1 and 2. It is important to mention again, at this point, that PCs were chosen on the basis of having attained pretest scores from 7-14, while NCs were chosen on the basis of having attained pretest scores from 0-2. Thus, as Table 1 indicates, at the time of the posttest, NCs obtained a mean score of 8.47 indicating that that had achieved a level of understanding within the criteria for classification as Partial Compensators. Table 3 presents the means for each cell of the design.

Tables 4 through 6 present the ANCOVAS on each of the three spatial task phases. As Table 4 shows, on the pre-comparison phase, a significant main effect for the covariate (the pretest scores) was found. Three PCs obtained the maximum score (18) on the pre-comparison phase: 1 male non-friend, 1 female friend, and 1 male friend. On the post-comparison phase (see Table 5), a significant main effect for the covariate was also found. Nine PCs obtained the maximum score on the post-comparison phase: 1 female non-friend, 3 male non-friends, 2 female friends, and 3 male friends. On the posttest (see Table 6) a significant main effect for the covariate was also found. Seven PCs obtained the maximum score on the posttest: 1 female non-friend, 2 male non-friends, and 4 male friends. No NCs obtained the maximum score on any of the phases.

Tables 7 through 10 present the ANCOVAS on each of the four change measures. For the Change 1 measure (see Table 7), the Change 2 measure (see Table 8) and the Change 4 measure (see Table 10), the only significant independent variable found was the covariate (pretest scores).

Table 1

Means and Standard Deviations for Spatial Task by Friendship Status, Sex, and Compensation Level

	Friendship Status		Sex		Compensation Level	
Task Phases	Friend (n=32)	NonFriend (n=32)	Female (n=32)	Male (n=32)	PC[a] (n=32)	NC[b] (n=32)
Pretest	5.31	4.97	4.41	5.88	9.88	0.41
S.D.	5.32	4.82	4.35	5.62	2.26	0.56
PreComp.	7.53	8.41	6.56	9.38	11.03	4.91
S.D.	5.07	5.18	4.45	5.41	4.94	3.11
PostComp.	13.03	13.28	11.84	14.47	14.19	12.13
S.D.	5.27	4.17	5.18	3.86	4.57	4.70
Posttest	10.91	9.97	9.31	11.56	12.41	8.47
S.D.	5.80	5.53	5.51	5.68	5.45	5.28

[a]Partial Compensator. [b]NonCompensator.

Table 2

Means and Standard Deviations for Change Measures by Friendship Status, Sex, and Compensation Level

	Friendship Status		Sex		Compensation Level	
Change Measure	Friend (n=32)	NonFriend (n=32)	Female (n=32)	Male (n=32)	PC[a] (n=32)	NC[b] (n=32)
Change 1[a]	2.22	3.44	2.16	3.50	1.16	4.50
S.D.	4.30	4.21	4.14	4.15	4.11	3.96
Change 2[b]	5.50	4.88	5.28	5.09	3.16	7.22
S.D.	4.60	4.23	4.18	4.68	3.38	4.56
Change 3[c]	-2.13	-3.31	-2.53	-2.91	-1.78	-3.66
S.D.	5.37	3.86	4.71	4.72	5.11	4.07
Change 4[d]	5.59	5.00	4.91	5.69	2.53	8.06
S.D.	6.21	5.59	5.92	5.91	4.72	5.58

[a]Change 1 = PreComparison minus Pretest

[b]Change 2 = PostComparison minus PreComparison

[c]Change 3 = Posttest minus PostComparison

[d]Change 4 = Posttest minus Pretest

Table 3

Means for Spatial Task and Change Measures by Friendship Status, by Sex, and by Compensation Level

	Friends (n=32)				NonFriends (n=32)			
	Males (n=16)		Females (n=16)		Males (n=16)		Females (n=16)	
Task Measures	PC (n=8)	NC (n=8)	PC (n=8)	NC (n=8)	PC (n=8)	NC (n=8)	PC (n=8)	NC (n=8)
Pretest	11.8	0.4	8.8	0.4	10.6	0.8	8.4	0.1
PreComp.	11.9	5.4	8.4	4.5	14.4	5.9	9.5	3.9
PostComp.	15.8	13.8	11.6	11.0	16.4	12.0	13.0	11.8
Posttest	12.9	9.8	12.9	8.1	15.0	8.6	8.9	7.4
Change 1	0.1	5.0	-0.4	4.1	3.8	5.1	1.1	3.8
Change 2	3.9	8.4	3.3	6.5	2.0	6.1	3.5	7.9
Change 3	-2.9	-4.0	1.3	-2.9	-1.4	-3.4	-4.1	-4.4
Change 4	1.1	9.4	4.1	7.8	4.4	7.9	0.5	7.3

Table 4

Analysis of Covariance on PreComparison Scores

Source	SS	df	MS	F
Covariate	783.96	1	783.96	57.34***
Friendship (F)	23.36	1	23.36	1.71
Sex (S)	23.21	1	23.21	1.70
Compensation (C)	14.68	1	14.68	1.07
F x S	6.92	1	6.92	.51
F x C	28.88	1	28.88	2.11
S x C	.40	1	.40	.03
F x S x C	2.87	1	2.87	.21
Error	751.98	55	13.67	

Note. The covariate was the pretest scores.

***$p < .001$.

Table 5

Analysis of Covariance on PostComparison Scores

Source	SS	df	MS	F
Covariate	119.95	1	119.95	5.70*
Friendship (F)	2.79	1	2.79	.13
Sex (S)	45.71	1	45.71	2.17
Compensation (C)	9.38	1	9.38	.45
F x S	10.20	1	10.20	.49
F x C	13.65	1	13.65	.65
S x C	4.80	1	4.80	.23
F x S x C	5.74	1	5.74	.27
Error	1157.07	55	21.04	

Note. The covariate was the pretest scores.

*$p < .05$.

Table 6

Analysis of Covariance on Posttest Scores

Source	SS	df	MS	F
Covariate	349.87	1	349.87	12.49***
Friendship (F)	7.57	1	7.57	.27
Sex (S)	18.44	1	18.44	.66
Compensation (C)	10.63	1	10.63	.38
F x S	34.13	1	34.13	1.22
F x C	1.40	1	1.40	.05
S x C	.02	1	.02	.00
F x S x C	57.46	1	57.46	2.05
Error	1540.42	55	28.01	

Note. The covariate was the pretest scores.

***$p < .001$.

Table 7

Analysis of Covariance on Change 1 Measure

Source	SS	df	MS	F
Covariate	145.14	1	145.14	10.62**
Friendship (F)	23.36	1	23.36	1.71
Sex (S)	23.21	1	23.21	1.70
Compensation (C)	14.70	1	14.70	1.07
F x S	6.92	1	6.92	.51
F x C	28.88	1	28.88	2.11
S x C	.40	1	.40	.03
F x S x C	2.87	1	2.87	.21
Error	751.97	55	13.67	

Note. The covaraite was the pretest scores.

**$p < .01$.

Table 8

Analysis of Covariance on Change 2 Measure

Source	SS	df	MS	F
Covariate	290.61	1	290.61	20.43***
Friendship (F)	10.01	1	10.01	.70
Sex (S)	3.77	1	3.77	.27
Compensation (C)	.59	1	.59	.84
F x S	33.90	1	33.90	2.38
F x C	2.82	1	2.82	.20
S x C	2.42	1	2.42	.17
F x S x C	.49	1	.49	.04
Error	782.61	55	14.23	

Note. The covariate was the pretest scores.

***$p < .001$.

Table 9

Analysis of Covariance on Change 3 Measure

Source	SS	df	MS	F
Covariate	60.10	1	60.10	2.82
Friendship (F)	19.55	1	19.55	.92
Sex (S)	6.09	1	6.09	.29
Compensation (C)	.04	1	.04	.00
F x S	81.63	1	81.63	3.83*
F x C	6.30	1	6.30	.30
S x C	5.46	1	5.46	.26
F x S x C	26.87	1	26.87	1.26
Error	1172.76	55	21.32	

Note. The covariate was the pretest scores.

*$p < .05$.

Table 10

Analysis of Covariance on Change 4 Measure

Source	SS	df	MS	F
Covariate	455.47	1	455.47	16.26***
Friendship (F)	7.57	1	7.57	.27
Sex (S)	18.44	1	18.44	.66
Compensation (C)	10.63	1	10.63	.38
F x S	34.13	1	34.13	1.22
F x C	1.40	1	1.40	.05
S x C	.02	1	.02	.00
F x S x C	57.46	1	57.46	2.05
Error	1540.42	55	28.01	

Note. The covariate was the pretest scores.

***$p < .001$.

On the Change 3 measure (see Table 9), a significant friendship by sex interaction was obtained, F (1,55) = 3.82, $p < .05$. A Newman Keuls post hoc analysis was used to determine if there were any significant differences between means. The four subgroups obtained the following scores on Change 3: female friends (M = -0.81), female non-friends (M = -4.25), male friends (M = -3.44), and male non-friends (M = -2.38). The Newman Keuls revealed no significant differences between the means.

The ANCOVA findings indicated that initial levels of compensation (pretest scores) had a significant effect upon subsequent performances. Consequently, three step-wise multiple regression analyses were performed to examine the predictive value of the pretest, and the other independent variables, upon the spatial task scores. Each phase (pre-comparison, post-comparison, and posttest) served as the dependent variable, and the eight terms were added in three steps, according to the groupings listed on Tables 11 through 13. The results indicate that the first two terms (pretest and pretest squared) account for 49 percent of the variance in pre-comparison scores (see Table 11), 16 percent of the variance in post-comparison scores (see Table 12), and 26 percent of the variance in posttest scores (see Table 13).

In order to examine within group differences, separate analyses of the PCs' and NCs' performances across the four phases were examined by use of profile analyses. A significant difference was found between the PCs' pre-comparison scores (M = 11.03) and post-comparison scores (M = 14.19), F (1,31) = 27.74, $p < .01$. There was also a significant difference between the PCs' pretest scores (M = 9.88) and posttest scores (M = 12.41), F (1,31) = 9.15, $p < .01$. For the NCs, the following

Table 11

Step-wise Multiple Regression Results Predicting PreComparison Scores

Variable	Multiple R	R^2	R^2 Change	Simple R
Pretest (P)	.69	.47	.47**	.69
P Squared	.70	.49	.02	.70
Sex (S)	.72	.51	.02	-.28
Friendship (F)	.73	.53	.02	-.09
S x F	.73	.53	.01	-.17
P x S x F	.73	.53	.00	.07
P x S	.73	.54	.00	.15
P x F	.74	.54	.01	.32

Note. The independent variables were entered into the equation in three steps, according to the above groupings.

**$p < .01$.

Table 12

Step-wise Multiple Regression Results Predicting PostComparison Scores

Variable	Multiple R	R^2	R^2 Change	Simple R
Pretest (P)	.29	.09	.09*	.29
P Squared	.40	.16	.07*	.35
Sex (S)	.43	.19	.03	-.28
Friendship (F)	.44	.19	.00	-.03
S x F	.44	.19	.00	-.23
P x S x F	.44	.20	.00	-.08
P x S	.45	.20	.00	-.08
P x F	.46	.21	.01	.14

Note. The independent variables were entered into the equation in three steps, according to the above groupings.

*$p < .05$.

Table 13

Step-wise Multiple Regression Results Predicting Posttest Scores

Variable	Multiple R	R^2	R^2 Change	Simple R
Pretest (P)	.41	.17	.17**	.41
P Squared	.51	.26	.09**	.47
Sex (S)	.51	.26	.00	-.20
Friendship (F)	.51	.26	.00	.08
S x F	.54	.29	.03	.01
P x S x F	.55	.30	.01	.17
P x S	.55	.31	.00	.05
P x F	.57	.32	.02	.28

Note. The independent variables were entered into the equation in three steps, according to the above groupings.

**$p < .01$.

significant differences were found: pretest (M = 0.41) vs. pre-comparison (M = 4.91), F (1,31) = 62.77, $p < .01$; pre-comparison vs. post-comparison (M = 12.13), F (1,31) = 102.26, $p < .01$; and post-comparison vs. posttest (M = 8.47), F (1,31) = 25.73, $p < .01$. There was also a significant difference between the NCs' pretest and posttest scores, F (1,31) = 66.76, $p < .01$. These results indicate that both the PCs and NCs made significant pre- to posttest gains.

The major hypothesis of this study was that there would be a strong, positive relationship between those children who recognize and reconcile their differences when working collaboratively on cognitive reasoning tasks, and the extent of individual progress these children later evidence when working alone on these same types of tasks.

This hypothesis was examined by performing a Pearson correlation between Change 2 (post-comparison minus pre-comparison, which measured the reconciliation of differences) and Change 4 (posttest minus pretest, the gain measure), r (62) = .32, $p < .005$. When these two measures were correlated with the pretest scores partialled out, r (62) = .11, $p > .05$, and there was no longer a significant relationship between these measures.

The Course of Social Interaction

Figures 4, 5, and 6 are graphic depictions of the mean scores children obtained on the four spatial task phases. Figure 4 presents the scores obtained for PCs and NCs who were either friends or non-friends. Figure 5 presents the scores obtained for PCs and NCs who were either male or female. Figure 6 presents the scores obtained for friends and non-friends who were either male or female. These figures indicate that a similar pattern emerges, regardless of which of the three

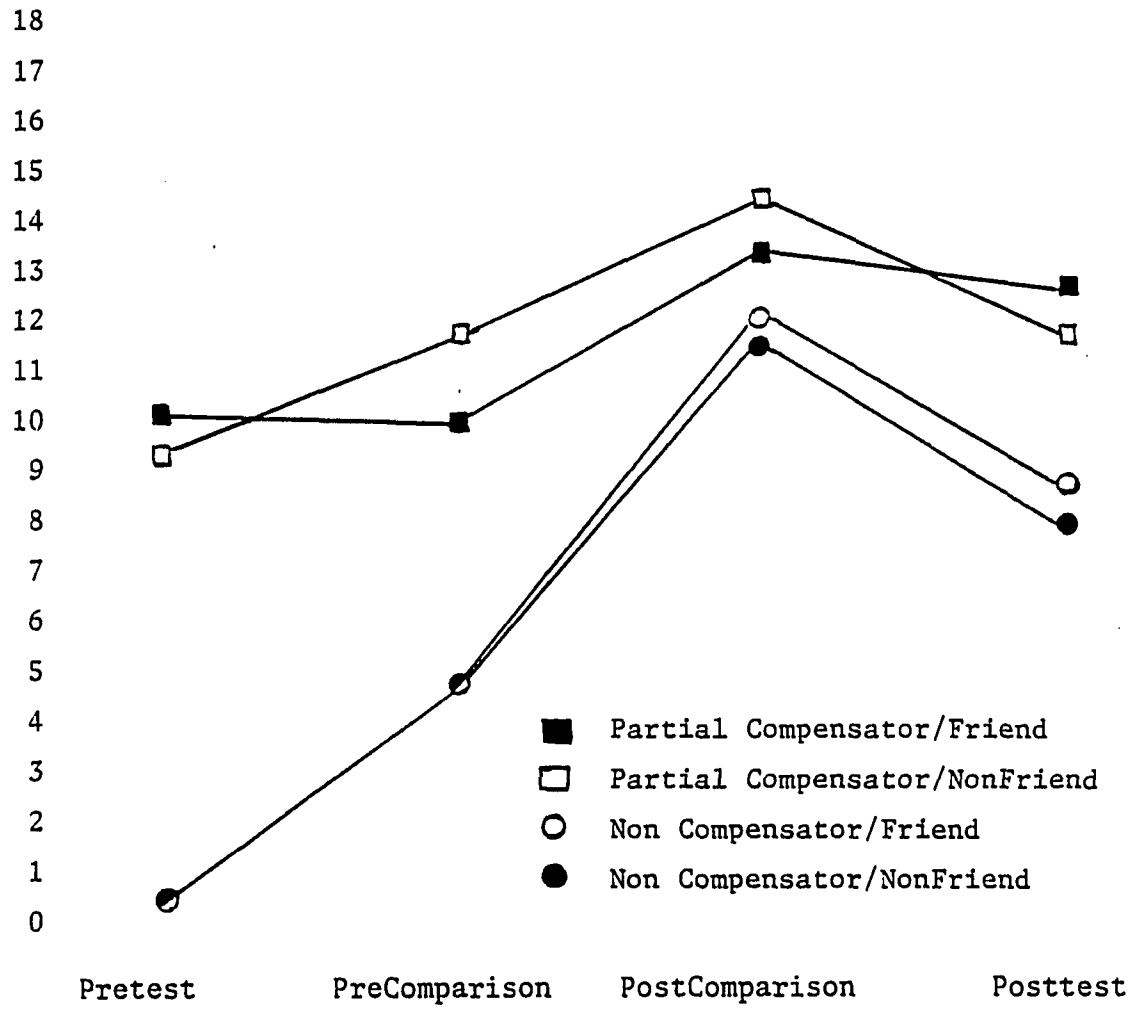

Figure 4. Mean Scores on the spatial task according to compensation level and friendship status.

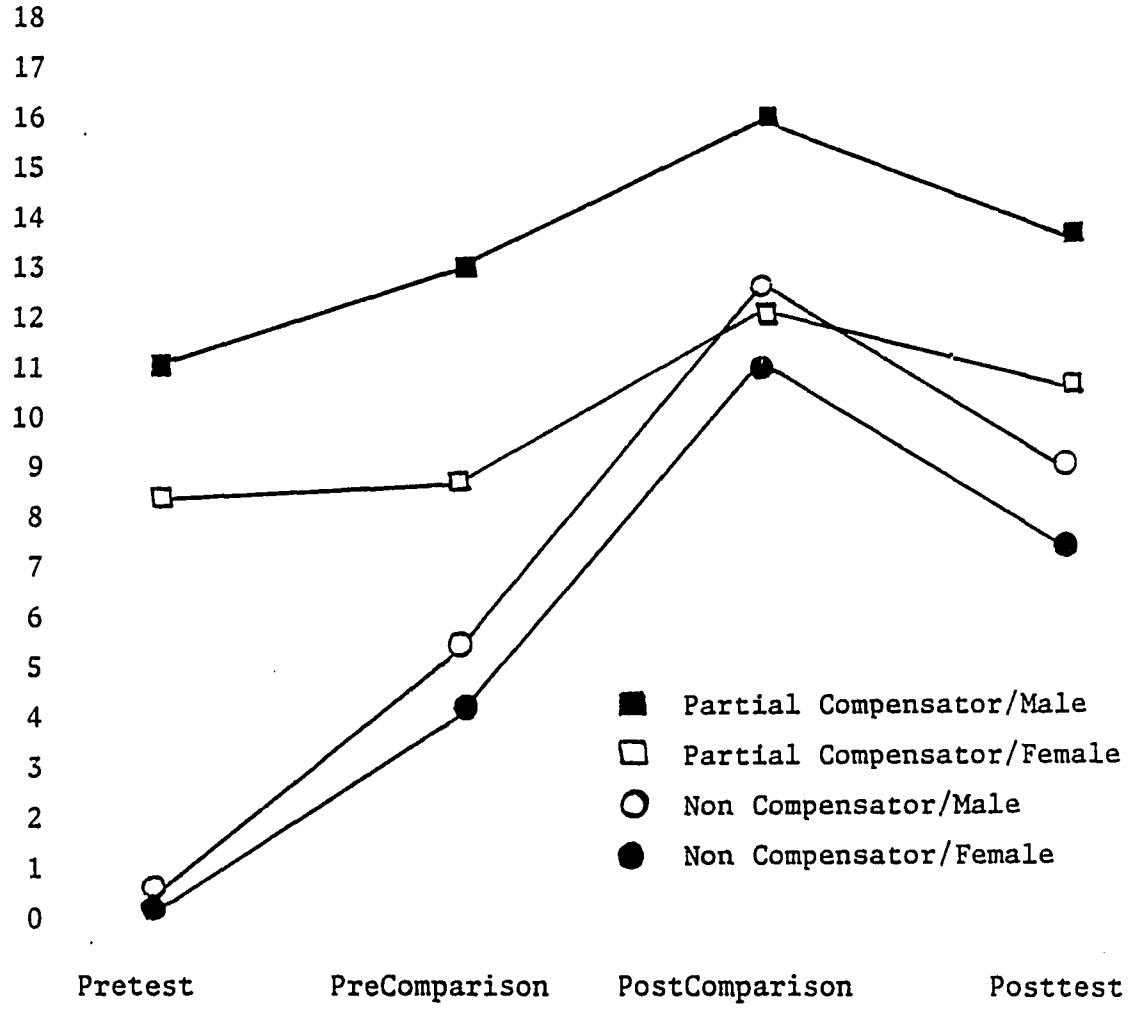

Figure 5. Mean scores on the spatial task according to compensation level and sex.

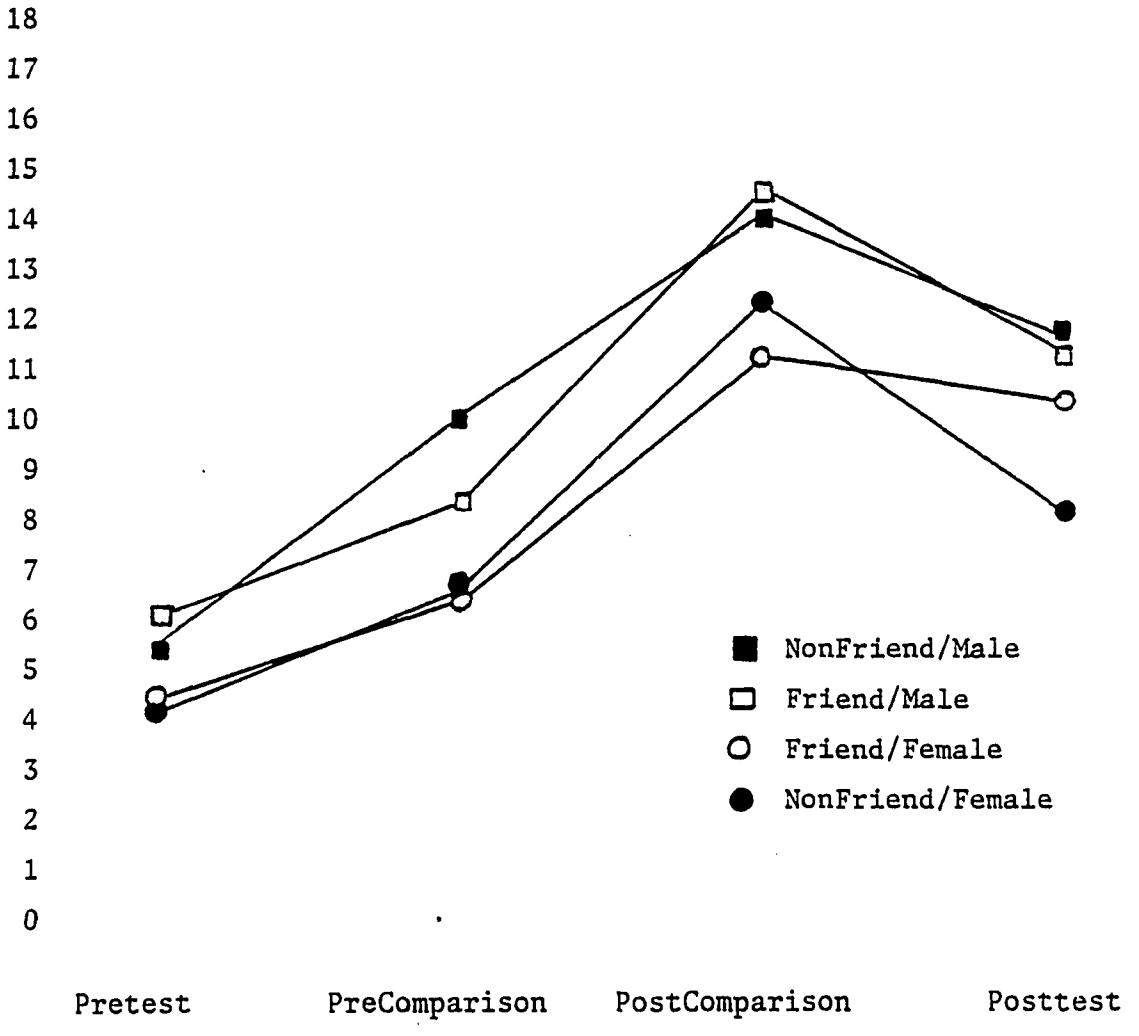

Figure 6. Mean scores on the spatial task according to friendship status and sex.

independent variables is collapsed over. In all cases, the highest scores were obtained during the post-comparison phase, when the children had the opportunity to recognize and reconcile discrepancies in their respective display arrangements. Although there was some regression when they were individually posttested, in all cases, the posttest scores are considerably higher than the initial pretest scores.

Four separate MANOVAS were performed on each of the displays across the phases in order to obtain a more detailed understanding of the course and effects of social interaction. The independent variable was compensation level (PC or NC) and the dependent variables were the four phases. The means and standard deviations are presented in Table 14. Figure 7 depicts the PCs and NCs mean scores on the four displays for each phase. Table 15 presents the significant effects based on the multiple analysis of variance comparing the NCs and PCs on the four displays. The first set of results presents significant differences in mean scores obtained on the displays for each phase of the experiment. As can be seen, aside from the designated initial differences at the pretest, there are no significant differences between the two groups performances on the other phases for Displays 3 and 4. Similarly, on Display 4, there are no differences between the two groups' rate of change from one phase to the next. Lastly, on all four displays, there are differences between the two groups' average scores on the first two and last two phases. This is due to the fact that the groups differed more on the first two phases than on the last two phases, where the NCs' performances closely paralleled those of the PCs.

Table 14

Means and Standard Deviations for NCs and PCs on each Display by Phase

	Pretest	PreComparison	PostComparison	Posttest
Display 1 (0-3)				
PC Mean	1.7	1.8	1.9	2.1
S.D.	1.4	1.4	1.4	1.4
NC Mean	0.0	0.1	0.8	1.8
S.D.	0.0	0.5	0.9	1.5
Display 2 (0-4)				
PC Mean	2.5	2.8	3.3	2.9
S.D.	1.2	1.3	1.1	1.3
NC Mean	0.1	0.9	2.9	1.8
S.D.	0.7	1.5	1.4	1.4
Display 3 (0-5)				
PC Mean	2.9	3.2	4.1	3.6
S.D.	1.2	1.7	1.5	1.7
NC Mean	0.1	1.9	3.7	2.3
S.D.	0.3	1.8	1.8	1.9
Display 4 (0-6)				
PC Mean	2.7	3.3	4.8	3.8
S.D.	1.2	1.8	1.6	1.9
NC Mean	0.5	2.0	4.6	2.6
S.D.	0.8	1.4	1.7	1.8

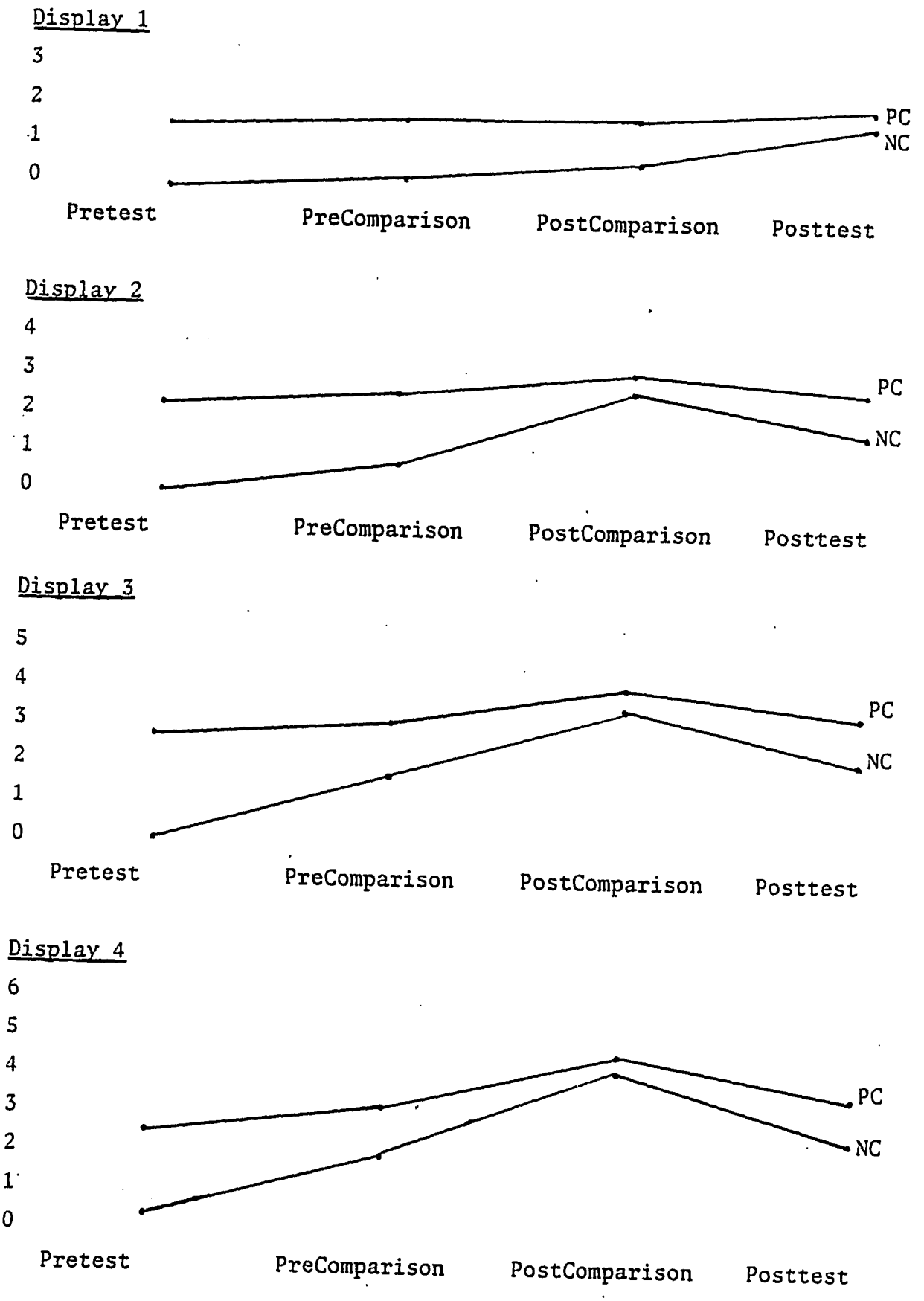

Figure 7. PCs and NCs mean scores on the four displays for each phase.

Table 15

Significant Multiple Analysis of Variance Effects Comparing NCs and PCs on the Four Displays

	Display 1	Display 2	Display 3	Display 4
Differences between Means				
Pretest	*	*	*	*
PreComparison	*	*		
PostComparison	*			
Posttest		*		
Differences between Rates of Change				
Pretest to PreComparison			*	
PreComparison to PostComparison	*	*		
PostComparison to Posttest	*			
Differences between Average Means				
Pretest and PreComparison	*	*	*	*
PostComparison and Posttest	*	*	*	*

*$p < .05$.

The Influence of Friendship Relations on Social Interaction and Cognitive Growth

The second and third hypotheses concerned the expectation of a significant sex by friendship interaction on Change 4 (posttest minus pretest, the gain measure), and was examined by the ANCOVA reported on Table 10. As previously mentioned, no significant friendship by sex interaction was obtained on this measure.

Summary of Friendship Choices

Five male dyads were paired according to mutual first choice (five PCs with five NCs). One male dyad was paired according to mutual second choice (one PC with one NC). Two male dyads were paired according to first choice with second choice (the two PCs were paired with NCs who were their first choice, the two NCs had chosen these respective PCs as their second choices).

Three female dyads were paired according to mutual first choice (three PCs with three NCs). Two female dyads were paired according to mutual second choice (two PCs with two NCs). Three female dyads were paired according to first choice with second choice (the three PCs were paired with NCs who were their first choice, the three NCs had chosen these respective PCs as their second choices).

Thus, 21 children, 12 males (seven PCs and five NCs), and nine females (six PCs and three NCs) were paired with their first friendship choice. Eleven children, four males (one PC and three NCs) and seven females (two PCs and five NCs) were paired with their second friendship choice.

The Effect of Friendship Choice on Extent of Change during Social Interaction

Another important area which required examination was the possible effect of friendship choice on the extent of change made during social interaction. This was examined by the use of a *t* test. The independent variables were friendship choice. Twenty-one children were paired with their first friendship choice, and eleven were paired with their second friendship choice. The dependent variable was Change 2 (post-comparison minus pre-comparison, which measured the reconciliation of differences). The children paired with their first choice had a mean score of 4.1 (S.D. = 3.8) on Change 2. The children paired with their second choice had a mean score of 8.2 (S.D. = 5.0) on Change 2. A significant difference was found between these two groups, $t(1,30) = -2.59$, $p < .02$. Based on their Change 2 means, those friends who were paired with their second choice, modified their arrangements significantly more than friends who were paired with their first friendship choice (best friend).

In order to confirm that this significant finding was not an artifact of differences in compensation levels, a chi square was applied to a 2 x 2 table of independent variables, using Yates correction for small cell frequencies. The independent variables were: PC vs. NC, and first friendship choice vs. second friendship choice. The chi square was not significant, indicating that the significant differences obtained by the t-test cannot be attributed to a relationship between friendship status and cognitive level classification.

Chapter 5

Discussion

The present study investigated the influence of peer relations specifically, friendship, upon social interaction and cognitive growth. Prior cognitive-developmental studies in this area have focused exclusively on demonstrating the importance of the cognitive relationships which exist between partners in order for them to profit from social interaction. Studies thus far, however, have not examined the possible effects of the type of affective relationships which may exist between the partners. One of the purposes of this study was to examine this potentially important factor. This was accomplished by comparing pairs of self-selected friends (mutual best friends, first choice with second choice, and mutual second choices) with pairs of children who were, at most, acquaintances (i.e., they did not appear on each others' list of friends or 'enemies', and came from different fifth grade classes).

Social Interaction and Cognitive Growth

The socio-cognitive conflict model of development stresses the primacy of social interaction in fostering cognitive growth. The central idea is that social coordination of action precedes and facilitates the individual coordination of actions. Growth is said to be a result of the reconciliation of differences between the individual's response strategy and those of others. Thus, studies in this area have shown that collective performances are structurally superior to those of the group members taken individually; that children make cognitive gain as a result of having participated in social interactions where problem solving approaches differed; and that a less competent, but conflicting

partner helps intermediate-level children to progress.

In accordance with this model, it was hypothesized that the children who recognized and reconciled differences between their own and their partner's display arrangements would make more growth than those who did so to a lesser extent. This hypothesis, however, was not confirmed. Although other results obtained by this study are consistent with the theoretical position outlined above, the lack of this crucial relationship makes the task of interpreting these findings much more tentative and complex.

The most novel element in this study was the use of a screen to block the children's viewing each other's arrangements during the pre-comparison aspect of the experiment. It proved to be an excellent source of motivation as the partners were quite interested in seeing each other's arrangements, and during the post-comparison aspect of the experiment, discussions and manipulations of the materials generally occurred spontaneously and with relative ease.

The pre- and post-comparison phases offered an advantage over other social interaction studies in that they allowed for the assignment of individual scores immediately prior to and after collective problem solving had ensued. In previous social interaction studies which used spatial tasks (Bearison, 1983; Doise et al., 1975; Doise & Mugny, 1979; Mugny & Doise, 1978), there was no device to ascertain the individual contributions of each partner during social problem solving because they worked on one common display. This procedure also permitted a more direct view of the process by which each partner

moved from one phase to the next. It was thereby possible to examine separately the PCs' and NCs' performances at each phase of the study, and their transition from one phase to the next.

The ANCOVAS indicated that there were significant differences between the PCs' and NCs' performances on each of the spatial task phases. This was not unexpected given the initial differences in their spatial compensation abilities (NC pretest $\underline{M}$ = 0.4, PC pretest $\underline{M}$ = 9.9). The important findings, however, are not related to between group differences on each of the phases, but rather, to comparisons of within group differences between the phases. The profile analyses, which were conducted separately on the PCs and NCs and examined pair-wise comparisons of their respective mean scores on adjacent phases, yielded results which provided important information on the course of social interaction.

Differences between both the PCs and NCs mean scores from one phase to the next will be described in some detail, and various interpretations of the results will be offered.

The profile analyses indicated that there was a significant difference between the NCs' pretest ($\underline{M}$ = 0.4) and pre-comparison ($\underline{M}$ = 4.9) scores, while no significant difference was found between the PCs' pretest ($\underline{M}$ = 9.9) and pre-comparison (11.0) scores. Before offering possible explanations for these findings, it is important to point out that the pre-comparison and post-comparison aspects of the study were presented in a consecutive manner. That is, the children initially constructed Display 1 while their respective

arrangements were separated by a screen and these arrangements were traced (pre-comparison). The screen was then removed, and after the children compared and modified their arrangements of Display 1, these arrangements were also traced (post-comparison). The screen was then replaced, and they were presented with Display 2, and so on. Consequently, any differences between the children's pretest and pre-comparison performances must be viewed with particular regard to the effects of joint problem solving on prior displays to individual problem solving attempts on subsequent displays. In other words, joint activity (post-comparison) on Display 1 for example, may have helped to improve independent problem solving (pre-comparison) on Display 2. This means that the significant difference between the NCs' mean pretest and pre-comparison scores can be explained by reference to their immediately profiting from each of the social situations which transpired prior to the presentation of the subsequent display. However, whether the NCs' pretest to pre-comparison gains can be attributed to the emergence and resolution of socio-cognitive conflicts arising during each of these social encounters or to observational learning which occurred during these social situations, remains problematic. The lack of a significant difference between the PCs' pretest and pre-comparison scores indicates that these children were not immediately affected by each of the opportunities for joint problem solving as their pre-comparison performance was quite similar to that evidenced at the pretest.

The profile analyses revealed that both the PCs and NCs respectively,

made significant pre-comparison (PC $\underline{M}$ = 11.0, NC $\underline{M}$ = 4.9) to post-comparison (PC $\underline{M}$ = 14.2, NC $\underline{M}$ = 12.1) gains. The contrast between the pre-comparison and post-comparison scores is based on the difference between the pre-comparison arrangements, which were constructed individually by each partner, and the post-comparison arrangements, which were the result of the children's comparing and modifying their respective pre-comparison arrangements.

The finding that both the NCs and PCs made significant pre- to post-comparison gains can be viewed as lending further support to the evidence provided by Doise and his colleagues that even more advanced partners profit from problem solving efforts with less advanced partners. The PCs did not regress as a result of working with less competent partners. Along the same lines, the NCs did not require a superior partner who provided the correct responses in order to make gains. During the post-comparison phase, less than one-third of the NCs had PC partners who correctly assembled all four displays.

While the NCs' pre- to post-comparison gain may be most parsimoniously explained by observational learning from their more advanced partners, the PCs' growth cannot be as easily accounted for in a similar manner as their NC partners' arrangements were less correct than those of their own. However, even though the NCs' pre-comparison arrangements were, in general, inferior to their PC partners' pre-comparison arrangements, it is still possible that the PCs may have benefited from some aspect of their NC partners' pre-comparison arrangements and may have improved their own arrangements along this dimension as a result of observational learning from their NC partners.

Another possible explanation for the NC's improvement could be that this was a direct result of their PC partners dominating the problem solving situation. Informal observations during this phase, however, indicate that this was not the case. Perhaps because the partners had their own materials, and dyads did not have to work together on one common display, there was no instance when a PC dominated completely by reconstructing a NCs' arrangement. Although there were many times when partners would touch each other's blocks, this was always done in order to demonstrate a point which one child was attempting to make to the other. Often the child would then return the block(s) to his or her partner's original position. Also, the significant difference found on the ANCOVA between the PCs' and NCs' post-comparison scores (PC $\underline{M}$ = 14.2 vs. NC $\underline{M}$ = 12.1, $\underline{p} < .05$), indicates that the PCs did not control their NC partners' arrangements. Furthermore, the significant difference between the PCs' pre-comparison and post-comparison scores suggests that the PCs did not rely solely on their initial understanding of the task, but actually improved their performance while working with their NC partners.

Doise et al. (1978), using a spatial transformation task, obtained results similar to those found in the present study and offered the following explanation of the interaction: "The PC whose system is less stable (than a total compensator's) is perturbed by the unacceptable solution proposed by the NC, although he does not yet possess the cognitive instruments necessary to solve the problem. While looking for a satisfactory solution, the PCs explicate their strategy and the problems they face. As a result, they progress, but so do the NCs

who are able to take part in the search for a correct solution" (p. 191). Allen and Feldman (1973) obtained similar results on the tutoring effect. They found that low achieving students who tutored other children made progress. Such findings are consistent with a constructionist approach to knowledge. The PCs in the present study can be seen as having elaborated and broadened their understanding during problem solving interactions with less advanced (NC) partners.

With respect to the cognitive originality of the mutually influenced arrangements, it is worthwhile to examine the predictive value of the children's initial levels of compensation upon their subsequent performances. While their pretest scores accounted for 47 percent of the variability in their pre-comparison scores, and 17 percent of the variability in their posttest scores, they only accounted for 9 percent of the variability in post-comparison scores.

While it could be proposed that both the PCs and NCs made significant pre- to post-comparison gains as a result of having learned the rules regarding the need to coordinate the right/left and front/back dimensions, these rules were never presented in a clear or consistent manner during social interaction. Informal observations indicate that while the children did attempt to provide arguments for their arrangements, they primarily relied upon physically manipulating the materials while using terms such as: opposite; here, there; this way, that way; and near/close, far. Given these conditions, the children's growing capacity to coordinate these dimensions cannot be easily attributed to exposure to clear and consistent verbal information.

It is tempting, therefore, to attribute these pre- to post-comparison gains to the partners' profiting from the cumulative effects of socio-cognitive conflicts which arose during problem solving interactions. It is not possible to interpret this particular finding with certainty, however, because of the lack of a significant relationship between the extent of change which occurred during joint problem solving, and subsequent individual gain.

The Change 2 measure, which was derived by subtracting the pre-comparison scores from the post-comparison scores, was an index of the overall effects of inter-individual conflicts and coordinations, and the extent to which children reconciled differences in their respective arrangements. While it is not being claimed that Change 2 measured socio-cognitive conflict per se, it was defined as a measure of the product of these conflicts, i.e., the extent to which partners resolved conflicting or incompatible response strategies. Both the NCs and PCs made significant pre- to post-comparison gains, which would be expected by the theory. This finding, in fact, makes it even more difficult to understand why no significant relationship was found between Change 2 and the gain measure (posttest minus pretest, referred to in this study as Change 4), when initial levels of compensation were controlled for. Taken from a social learning theory perspective (Zimmerman & Blum, 1983), this lack of a relationship between change (the product of socio-cognitive conflicts) and subsequent growth, could be seen as an indication that cognitive conflict is neither necessary nor sufficient for intellectual development to take place. However, as has been mentioned, other factors which would be deemed as necessary for growth, such as rule consistent verbal learning, or observational

learning, were either absent from this study, or can only partially account for the results.

The NCs' and PCs' pre- to post-comparison gains might also be considered in terms of improvements in their perceptual abilities, or skill at extracting information about the properties of objects that make them distinguishable and identifiable. Gibson (1970) notes that perceptual learning is an adaptive process which is fostered by an internal need to reduce uncertainty. She writes: "Stimulation is not only full of potential information; there is too much of it . . . the search for invariants, both low-level contrastive features and high-level order, is the task of perception, while detection of them at once reduces uncertainty and is reinforcing" (p. 100). While perceptual learning may have played a role in the children's growing capacity to coordinate the right/left and front/back dimensions, it is unlikely that it was primarily responsible for their growth. It should be remembered that the children never viewed Displays 2 through 4 from the experimenter's perspective. Consequently, they had to conceptualize the experimenter's viewpoint (which was at a 180° to that of their own), as opposed to directly discriminating essential features of the blocks which were viewed from their own vantage points. Also, the children's growing improvement on this task was relative to their initial level of conceptual development in this area. The results suggest that while perceptual factors were important, this task was indeed tapping essential conceptual understanding, involving the awareness of spatial perspectives.

A significant difference was found on the profile analysis which examined the NCs' post-comparison ($\underline{M}$ = 12.1) and posttest ($\underline{M}$ = 8.5)

scores, indicating that their highest level of performance was attained when they worked collaboratively with their PC partners, and that they evidenced some regression when individually posttested. According to a socio-cognitive conflict model, intra-individual cognitive structuring is said to develop from inter-individual coordinations (Perret-Clermont, 1980). In the present study, the NCs' posttest scores were lower than their post-comparison (interaction) scores, but higher than their pretest and pre-comparison scores. This suggests that these children, with initially low level abilities, were able to internalize some of the coordinations which emerged during social problem solving, but not so completely that their individual productions at the posttest were equal to their mutually influenced performances. For the PCs, on the other hand, no significant difference was found between their post-comparison ($\underline{M}$ = 14.2) and posttest ($\underline{M}$ = 12.4) scores. This suggests that these children, with initially medium-level skills, were able to retain the improved abilities they had developed during the social situation, as they could subsequently put them into effect when individually posttested.

The mean post-comparison to posttest scores can also be examined with consideration given to the cumulative effects of practice which may have affected the distribution of scores. No definitive conclusions can be drawn as there was no group to control for social interaction. However, if practice effects were primarily responsible, it might be logically assumed that both the NCs and PCs would attain their highest scores at the posttest, when they had their final opportunity to arrange the displays. However, this was not the case; the highest

level of functioning for the NCs was obtained during the post-comparison phase, and there was no significant difference between the PCs' post-comparison and posttest performances.

An overall description of each pair-wise comparison of the NCs' and PCs' performances across the phases has been provided. The profile analyses also indicated that the PCs and NCs, respectively, made significant pretest to posttest gains. At the time of posttesting, the NCs' mean score of 8.5 indicates that they had attained a level of performance which fit the criteria for classification as PCs (spatial task scores of 7-14). The central problem, however, remains. Although both the NCs' and PCs' evidenced significant growth, their development cannot be easily attributed to the effects of socio-cognitive conflicts as no significant relationship was found between the children's amount of change during social interaction, and the extent of subsequent gain. References have also been made to social learning, perceptual learning, and practice effects as offering alternative ways to account for some of the findings. What the overall results suggest is that the social situation spurred development, but that there was, nonetheless, no clearcut pattern to be found between the amount of change evidenced during social interaction, and the extent of subsequent growth.

The studies by Doise and his colleagues which have employed spatial tasks have examined individual vs. group performances (Doise, Mugny & Perret-Clermont, 1975), differences between partners of varying compensation levels (Mugny & Doise, 1978), and differences between partners of the same ability level who approach the task from opposing viewpoints (Doise & Mugny, 1979). The children's gains were attributed to the

effects of socio-cognitive conflicts arising during the course of social interaction. Social learning theorists (Zimmerman & Blum, 1983) have criticized the interpretation of these results, noting weakness in attributing the children's growth to socio-cognitive conflict when actual measures of this construct were not included. While the experimental procedures used in this study did not directly measure socio-cognitive conflict, the Change 2 measure did reflect the product of these conflicts, namely the extent to which children recognized and reconciled discrepancies in their respective arrangements. The lack of a significant relationship between the change and gain (posttest minus pretest) measures can be viewed as casting a certain degree of doubt in calling upon socio-cognitive conflicts to account for development made after children have participated in social problem solving.

The Influence of Friendship on Social Interaction and Cognitive Growth

In the present study, the social relationships which existed between partners had only a minor effect upon the children's performances. This was the case despite the fact that for children of this age, friendship is an important and fairly stable relation which involves awareness of and concern for the other. Furthermore, great care was taken to ensure that the friendship pairings consisted of children who actually chose each other as friends, while non-friend pairings were of children who had very little contact with each other.

The overall context in which the experiment was presented, i.e., the setting, the nature of the task, and the role of the experimenter must also be considered in reviewing the findings. Subject-related factors which may have also influenced the outcome include: the

children's ages; the use of same-sexed pairings; for the friendship group, the basis on which friendships were established; and the children's perception of the purpose of this activity.

Attempts were made to ensure that the experiment allowed for naturalistic behaviors, e.g., friendship pairings were made on the basis of the children's own choices, and the experimenter made minimal interventions during the post-comparison phase. However, the fact that the children were tested in school and that the experimenter was present during the interaction phase may have modified the children's behaviors. For instance, had this experiment been conducted in an after-school recreational program, and had the experimenter been absent during social interaction, it is possible that differences between friends' and non-friends' working styles may have emerged. The examiner's presence, in and of itself, may have unwittingly influenced all partners towards engaging in task-relevant behaviors, regardless of their social relationship to one another.

Rather than indicating that social relationships are somewhat irrelevant to social problem solving situations, the overall findings suggest that the nature of the task, and the context in which it is presented, is crucial to understanding the children's behavior. The spatial task and the situation in which it was conducted did not include such elements as external rewards, equal or unequal ownership of means, or other experimental variables which have been employed in friendship studies. In fact, the social situation was purposely unstructured in order to allow for the emergence of naturally occurring behaviors.

In this particular experimental paradigm, the results suggest that the goal or purpose of the task generally took precedence over the

social relationships which existed between the partners. The post-comparison and posttest scores indicate that, overall, the children's behavior could best be characterized as task-oriented. Thus, there was only one statistical interaction between males and females who were either friends or non-friends. During social interaction, all of the children compared their arrangements to those of their partners and engaged in verbal exchanges; the great majority (including the PCs) also modified at least one of their four arrangements as a result of these interactions.

With respect to the friendship group itself, *t* tests revealed that children who were paired with their second friendship choice modified their arrangements significantly more than children who were paired with their first choice, or best friend in school. Neither sex nor initial compensation level affected this outcome. Based upon sex differences found in investigations of children's game-playing behavior (Lever, 1976) and in friendship studies (Berndt, 1981a; Maccoby & Jacklin, 1974), it had been hypothesized that girls who were close friends would attempt to maintain a 'conflict-free' social relation by ignoring or not grappling with differences in their respective display arrangements. The current finding appears to suggest that regardless of sex, the children who worked with their best friends did not modify their arrangements as much as did those who worked with their second choice. This finding suggests that those males and females working with their best friends did indeed attempt to keep the recognition of noncompatible responses to a minimum. It can further be speculated that they did so in order to maintain a harmonious relationship with their best friend.

On the other hand, children working with their second friendship choice appear to have been more willing to possibly upset their social relationship by recognizing and reconciling these differences, and modifying their respective arrays (in the direction of the correct arrangement). However, it must be pointed out that the expected relationship between the amount of modification and subsequent individual cognitive gain was not found by this study.

Implications for Education

This section will discuss three issues. The first concerns factors influencing experimental outcomes, which also have implications for classroom learning. The second is a brief summary of friendship and social development. The third focuses upon educational settings and friendship choices.

Factors Influencing Outcome

There are several variables which may have affected the experimental outcomes, and which may also have implications for school learning. For example, although the experimenter made minimal comments, and none of a didactic nature, her presence alone may have influenced the children, particularly during joint problem solving, towards task-directed behaviors. On the other hand, the experimenter did not give the children any feedback about their work. What if the children were given information about their respective performances at the conclusion of the post-comparison phase? How might adult appraisal have affected their post-test arrangements?

Friendship and Social Development

This study, while focused primarily upon the social development of knowledge, also touches upon social development itself, as friendship relations have long been recognized as an important determinant of children's social growth (Renshaw, 1981). Fine (1981), referring specifically about the age group used in this study, wrote that preadolescence represents a particularly significant period because in it children are expected to develop social ties that are not merely extensions of situations dominated by adults (parents and teachers). In most locales preadolescents are not constantly supervised by adults and can therefore develop their own private relationships. It is believed that these friendship relationships have considerable impact on shaping the child's social behavior and attitudes (Sullivan, 1953) and allow children to learn about themselves and society (Stone & Church, 1968).

Educational Settings and Friendship Relations

Overall, this study lends support to an educational methodology which encourages a 'hands on' and socially mediated approach to learning. As was demonstrated, peer interaction during problem solving led to an increased understanding of organizing spatial perspectives. Through discussion and physical activity, the children were able to develop and elaborate their conceptual understanding of spatial relationships. Such an approach has been advocated by Piaget (1976) who wrote: "No real intellectual activity could be carried on in the form of experimental actions and spontaneous investigations without free collaboration among individuals--that is to say, among the students themselves, and not only between the teacher and the student. Using the intelligence

assumes not only continual mutual stimulation, but also and more importantly mutual control and exercise of the critical spirit, which alone can lead the individual to objectivity and to a need for conclusive evidence" (pp. 107-108).

Having stated that an educational setting which stresses the relation of children to one another, of group work and common study (frequently referred to as an open classroom setting) is conducive to cognitive development, the question of its effect upon friendship patterns also deserves consideration. Hallinan (1976) investigated friendship patterns in open and traditional classrooms. The distribution of popularity in the traditional classrooms was found to be highly skewed, while it was considerably more uniform in the open classrooms. This suggests that opportunities to become known and liked through interaction increase the probability of a child's receiving some friendship choices. However, a significantly larger number of mutual choices was found in traditional classes, although mutual friendship were more stable in open classrooms. This suggests that exposure to a large number of potential friends in an open classroom leads students to become more selective in choosing their friends, resulting in a smaller number of actual friends. Also, increased interaction may make students more realistic in selecting friends and lead them to choose only those peers with whom they expect to establish an enduring relationship. Children in traditional classes gave and received more friendship choices than those in the open classrooms. Hallinan notes that if these results are generalizable, they present a dilemma to educators. Although open classrooms tend to decrease the number of social isolates, foster a more

uniform distribution of popularity, and support the stability of friendship choices, traditional classrooms seem to promote a large number of friendships. Thus the study shows that both environments have advantages and disadvantages for children's social development.

Implications for Future Research

This study was one of the first to examine the influence of friendship upon the course and nature of social problem solving. As with most studies which are examining new territory, many more questions have been raised than answered. Also, many contextual features have been identified as important variables which may have influenced the present findings.

One of the shortcomings of this study was that although friendship pairings were made according to the children's own choices, there was no baseline information regarding the children's knowledge about friendship. Future studies should obtain information about the children's conceptual and specific understanding of friendship. In other words, it would be useful to ask children for their definition of friendship, in a general sense, and for the basis on which they chose their actual friends. Not only would it be interesting to determine whether there was consensual validation between friends, i.e., that they chose each other for similar reasons, but it would also be important to ascertain if there are relationships between the basis on which the friendships were formed, and these same dyad's working styles on cognitive reasoning tasks. It would also be helpful to learn if the length of time that children have been friends would also play a role. Given this age group, one possibility might be the expectation of sex differences in friendship selection. This is, boys and girls may make their choices

based on different criteria (Maccoby & Jacklin, 1974). However, whether the basis of choice would influence their problem solving efforts must be left to empirical findings.

Some other issues that have already been alluded to include the effects of the examiner's presence during social interaction, which could be controlled for by having a group which is videotaped or observed through a one-way mirror during this period. A systematic analysis of the children's verbalizations would also be important in determining relationships between types of argument made, and/or other aspects of their communication, and the extent of individual gain. Another experimental variable which has been included in several friendship studies (Berndt, 1981a, 1981b; Newcomb, Brady, & Hartup, 1979) is the creation of a competitive atmosphere through the use of rewards. Since cooperation and sharing are salient characteristics of friendship, the creation of a competitive setting would provide an opportunity for the emergence of these behaviors and to observe whether competition has a differential impact upon the joint efforts of friends and non-friends and males and females, respectively.

In light of the potential influence of open and traditional classrooms upon children's social and cognitive development, another worthwhile study would be to compare the working styles and performances of friendship dyads from both types of classroom on a cognitive reasoning task.

In this study, no significant relationship was found between the amount of change children made during social interaction, and subsequent individual gain. The lack of a relationship between these measures is contrary to the theoretical formulations of a socio-cognitive conflict

model of development and can be viewed as supportive of a social learning theory view where conflict is not seen as a precondition for cognitive growth. Future studies should include experimental procedures which provide for the measurement of individual change during joint problem solving in order to determine if this crucial relationship between change and gain can be obtained.

References

Allen, V.F. & Feldman, R.S. (1973). Learning through tutoring: Low-achieving children as tutors. Journal of Experimental Education, 42, 1-5.

Bearison, D.J. (1983). New directions in studies of social interaction and cognitive growth. In F. Serafica (Ed.), Social cognition, context and social behavior: A developmental perspective. New York: Gilford Press.

Bearison, D.J. & Cassel, T.Z. (1975) Cognitive decentration and social codes: Communicative effectiveness in young children from differing family contexts. Developmental Psychology, II, 29-36.

Benton, A.A. (1971). Productivity, distributive justice and bargaining among children. Journal of Personality and Social Psychology, 18, 68-78.

Berndt, T.J. (1981). Effects of friendship on prosocial intentions and behavior. Child Development, 52, 636-643.

Berndt, T.J. (1981). Age changes and changes over time in pro-social intentions and behavior between friends. Developmental Psychology, 17, 408-416.

Bigelow, B.J. (1977). Children's friendship expectations: A cognitive developmental study. Child Development, 48, 246-253.

Bigelow, B.J. & LaGaipa, J.J. (1975). Children's written descriptions of friendships: A multidimensional analysis. Developmental Psychology, 11, 857-858.

Damico, S.B. (1975). Sexual differences in the responses of elementary pupils to the classroom. Psychology in the Schools, 12, 462-467.

Damon, W. (1977). The social world of the child. San Francisco: Jossey-Bass.

Damon, W. (1981). Exploring children's social cognition on two fronts. In J.H. Flavell & L. Ross (Eds.), Social cognitive developement. Cambridge, Mass.: Cambridge University Press.

Doise, W. & Mugny, G. (1979). Individual and collective conflicts of centrations in cognitive development. European Journal of Social Psychology, 9, 105-108.

Doise, W., Mugny, G. & Perret-Clermont, A. (1975). Social interaction and the development of cognitive operations. European Journal of Social Psychology, 5, 367-383.

Doise, W., Mugny, G., & Perret-Clermont, A. (1978). Social interaction and cognitive development: Further evidence. European Journal of Social Psychology, 6, 245-247.

Eder, D. & Hallinan, M.T. (1978). Sex differences in children's friendships. American Sociological Review, 43, 237-250.

Fine, G.A. (1981). Friends, impression management, and preadolscent behavior. In S. Asher & J. Gottman (Eds.) The development of children's friendships. New York: Cambridge University Press.

Flavell, J.H., Botkin, P.T., Fry, C.L., Wright, J.W., & Jarvis, P.E. (1968). The development of role-taking skills in children. New York: John Wiley & Sons, Inc.

Foot, H.D., Chapman, A.J., & Smith, J.R. (1977). Friendship and social responsiveness in boys and girls. Journal of Personality and Social Psychology, 35, 401-411.

Gibson, E. (1970). The development of perception as an adaptive process. American Scientist, 58, 98-107.

Gilligan, C. (1982). In a different voice. Cambridge, Mass.: Harvard University Press.

Hallinan, M.T. (1976). Friendship patterns in open and traditional classrooms. Sociology of Education, 49, 254-265.

Hayes, D.S. (1978). Cognitive bases for liking and disliking among preschool children. Child Development, 49, 906-909.

Inhelder, B., Sinclair, H. & Bovet, M. (1974). Learning and the development of cognition. Cambridge, Mass.: Harvard University Press.

Kuhn, D. (1972). Mechanisms of change in the development of cognitive structures. Child Development, 43, 833-844.

Lefebvre, M. & Pinard, D. (1972). Apprentissage de la conservation des quantités par une méthod de conflit cognitif. Revue Canadienne des Sciences du Comportement, 4, 1-12.

Lever, J. (1976). Sex differences in games children play. Social Problems, 23, 478-487.

Lèvy, M., Doise, W., & Mugny, G. (in press). Remise en question, modèle regressif et progrès cognitif.

Maccoby, E.E., Jacklin, C.N. (1974). The psychology of sex differences. Stanford, Ca.: Stanford University Press.

Mead, G.H. (1934). Mind, Self and Society. Chicago: University of Chicago Press.

Mugny, G. & Doise, W. (1978). Socio-cognitive conflict and structuration of individual and collective performances. European Journal of Social Psychology, 8, 181-192.

Mugny, G., Lèvy, M. & Doise, W. (1978). Conflit socio-cognitif et développement cognitif: L'effet de la présentation par un adulte de modèles "progressifs" et de modèles "regressifs" dans une épreuve de représentation spatiale. Revue Suisse Psychologie, 37, 22-43.

Mugny, G., Perret-Clermont, A. & Doise, W. (1981). Interpersonal coordinations and sociological differences in the construction of the intellect. In G.M. Stephenson & J.M. Davis (Eds.), Progress in applied social psychology, Vol. 1. New York: John Wiley & Sons, Ltd.

Murray, F. (1972). Acquisition of conservation through social interaction. Developmental Psychology, 6, 1-6.

Newcomb, A.F., Brady, J.F. & Hartup, W.W. (1979). Friendship and incentive condition as determinants of children's task-oriented social behavior. Child Development, 50, 878-881.

Perret-Clermont, A. (1980). Social interaction and cognitive development in children. New York: Academic Press.

Piaget, J. (1965) (originally published in 1932). The moral judgment of the child. New York: Free Press.

Piaget, J. (1960). The psychology of intelligence. Totowa, New Jersey: Littlefield, Adams & Co.

Piaget, J. (1976). To understand is to invent: The future of education. New York: Penguin Books.

Reisman, J.M. & Shorr, S.I. (1978). Friendship claims and expectations among children and adults. Child Development, 49, 913-916.

Renshaw, P.D. (1981). The roots of peer interaction reserach: A historical analysis of the 1930's. In S. Asher & J. Gottman (Eds.), The development of children's friendships. New York: Cambridge University Press.

Rosenthal, T.L. & Zimmerman, B.J. (1972). Modeling by exemplification and instruction in training conservation. Developmental Psychology, 6, 392-401.

Rubin, K.H. (1973). Egocentrism in childhood: A unitary construct? Child Development, 44, 102-110.

Scarlett, H.H., Press, A.N. & Crockett, W.H. (1971). Children's descriptions of peers: A wernerian developmental analysis. Child Development, 42, 439-453.

Selman, R. (1976). Toward a structural analysis of developing interpersonal relations concepts: Research with normal and disturbed preadolscent boys. In A. Pick (Ed.), Minnesota symposia on child psychology.

Sharabany, R. & Hertz-Lazarowitz, R. (1981). Do friends share and communicate more than non-friends? International Journal of Behavioral Development, 4, 45-59.

Staub, E. & Sherk, L. (1970). Need for approval, children's sharing behavior, and reciprocity in sharing. Child Development, 41, 243-252.

Stone, L.J. & Church, J. (1968). Childhood and adolescence (2nd edition). New York: Random House.

Sullivan, H.S. (1953). The interpersonal theory of psychiatry. New York: Norton Books.

Turiel, E. (1969). Developmental processes in the child's moral thinking. In P. Mussen, J. Langer & M. Covington (Eds.), Trends and issues in developmental psychology. New York: Holt, Rinehart & Winston.

Vygotsky, L.S. (1962) (originally published in 1934). Thought and language. Cambridge Mass.: MIT Press.

Vygotsky, L.S. (1978). Mind in society. Cambrdige Mass.: Harvard University Press.

Wertsch, J.V. (1979). From social interaction tc higher psychological processes: A clarification and application of vygotsky's theory. Human Development, 22, 1-22.

Wood, D. & Middleton, D. (1975). A study of assisted problem solving. British Journal of Psychology, 66 (2), 181-191.

Youniss, J. (1975). Another perspective on social cognition. In A. Pick (Ed.), Minnesota symposia on child psychology (Vol. 9). Minneapolis, Minn.: University of Minnesota Press.

Youniss, J. Affirmation (1976). Unpublished manuscript, Catholic University of America.

Youniss, J. (1978). Dialectical theory and piaget on social knowledge. Human Development, 21, 234-247.

Youniss, J. & Volpe, J. (1978). A relational analysis of children's friendships. In W. Damon (Ed.), New directions for child development (Vol. 1). San Francisco, Ca.: Jossey-Bass.

Zimmerman, B.J. & Blum, D.E. (1983). Toward an empirical test of the role of cognitive conflict in learning. Developmental Review, 3, 18-38.

Zimmerman, B.J. & Lanaro, P. (1974). Acquiring and retaining conservation of length through modeling and reversibility cues. Merril-Palmer Quarterly, 20, 145-161.

Zimmerman, B.J. & Rosenthal, T.L. (1974). Conserving and retaining equalities and inequalities through observation and correction. Developmental Psychology, 10, 260-268.