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Decalage and Social Interaction in
Children's Developing Theories of Mind

by

Mary Elizabeth Pool

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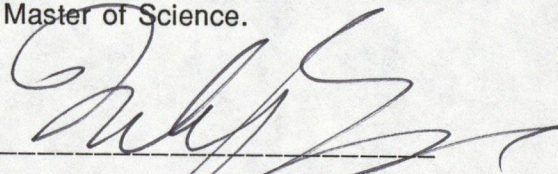
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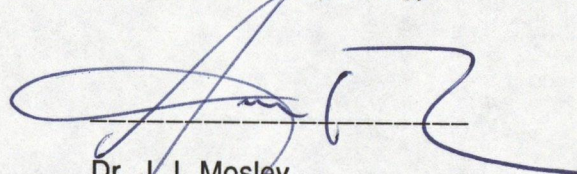
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FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled, "Decalage and Social Interaction in Children's Developing Theories of Mind" submitted by Mary Elizabeth Pool in partial fulfillment of the requirements for the degree of Master of Science.



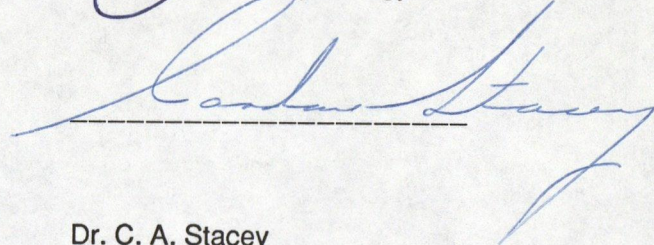
Supervisor, Dr. M. C. Boyes

Department of Psychology



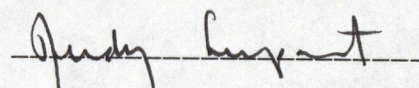
Dr. J. L. Mosley

Department of Psychology



Dr. C. A. Stacey

Department of Psychology



Dr. J. L. Lupart

Department of Educational Psychology

August, 1990

Abstract

The present research had two primary purposes. Phase one was designed to investigate the developmental progression of young children's beliefs about the source(s) and accessibility of knowledge and meaning. Phase two constituted an initial attempt to determine the nature of a presumed reciprocal relationship between children's developing theories of mind, the degree and style of peer interaction of which children are capable and the influence this might have on their level of epistemic competence.

In the first phase, 43 pre-school children, from 3 to 5 years of age, were individually presented with a series of traditional perspective taking tasks. Their scores, coded according to a three part scoring protocol (fail, transitional, pass), were examined to determine whether the tasks would be ordered along a continuum from least to most difficult, corresponding to age-related differences in level of epistemic competence. A Guttman scalogram analysis revealed that a task hierarchy did exist. However, differences in difficulty between tasks were found to be minimal, describing quantitative not qualitative change.

Nineteen pairs of 3 to 5 year old children, matched for age, served as subjects in phase two. Following a brief pre-test to establish existing competence, subjects were presented with a subset of three tasks, selected from those administered in phase one. In pairs, children were asked to discuss together the possible meanings or identities of the task stimuli before them. All portions of phase two were audio-recorded for later transcription. Phase two data revealed that interacting with a peer who functioned at a different level of epistemic competence constituted a disequilibrating experience which had a significant impact on subject's epistemic level.

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It is with a bittersweet blend of relief and nostalgia that I look upon the completed task and recall the frustrations and triumphs of the entire process. An academic thesis, though it may carry one name, is not the work of one person, but incorporates the efforts of many.

I would first like to thank my young subjects, whose enthusiastic participation and innocent delight made the "testing procedure" so enjoyable. I am grateful for the cooperation extended to me by the directors and staff of all the daycares visited. Maria Tepley, of The University of Calgary DayCare deserves special mention, not only for her cooperation, but for her sincere interest in this project. To those parents who so graciously allowed me to enter their home, I would like to express my gratitude.

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I am particularly thankful for the invaluable editorial assistance of Roslyn Mendelson, who took time from her own busy personal schedule to give me guidance.

Such a project as this is no doubt a work of "academia". However, no one of us brings to an academic endeavour only those aspects pertinent to such an environment. One's personal life, past and present is carried over into one's work, from the choice of thesis project, through the unique style of carrying it out, to its final completion. With this in mind, I would like to thank my friends, my fellow students and colleagues, my practicum supervisors and all those others who offered support and encouragement along the way. In this way it is their project also.

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Introduction

Acquisition of knowledge about the mind has long been regarded by developmental psychologists as one of the most significant forms of knowledge, both theoretically and ecologically, in all of human cognitive development (Flavell, Green & Flavell, 1988a). Traditionally the study of young children's developing theories of mind has fallen under the rubric of social-cognitive development. Research efforts related to young children's social-cognitive development has evolved since the early work of Jean Piaget, into a complicated multifaceted process. This domain is now composed of a myriad of content areas which are in turn, defined by a variety of theoretical orientations (Pillow, 1988).

Throughout its relatively brief history, research into the nature and course of social-cognitive development has focused on children's social role-taking abilities; their perspective taking skills in visual, conceptual and emotional contexts; children's conception of beliefs, false and inferred; their understanding of mental imagery and internal states, their own and others; children's ability to distinguish appearance from reality; and, children's conception of deception and lying (see Pillow, 1988 for a recent review). Developmental psychologists have tended however to investigate each of these content areas independently or sequentially, making few, if any, attempts to link them together and describe the course of development of children's theories of mind in a comprehensive manner.

A current trend within the social-cognitive developmental literature which shows some promise as a potential linking mechanism is to consider children's increasingly sophisticated capabilities from the more comprehensive perspective of their fundamental epistemic beliefs (Astington & Gopnik, 1989). That is, to attempt to integrate the diverse investigative directions taken and make sense of children's abilities in these areas within the broader framework of their beliefs about the source and

accessibility of knowledge and meaning, within the context of children's developing theories of mind.

Purpose and Rationale

The general purpose of this thesis is to gain a greater understanding of the process by which children come to "know" not only what they themselves know and how they know it, but the processes they employ and the contexts in which they apply them as they grapple to achieve an understanding of what others know; that is, to chart the ontogenetic interactive course of children's theories of mind. Researchers (Chandler & Boyes, 1982; Flavell, 1986; Masangkay et al., 1974; Piaget, 1929; Pillow, 1988) have documented conceptually and empirically the existence of a qualitative shift in children's cognitive abilities and the resultant change in abilities it brings to role-taking tasks, but disagree as to the age at which this shift occurs. Indeed, there has been considerable debate regarding the age at which this qualitative shift occurs, which has resulted in a research focus aimed at discovering evidence of this change earlier and earlier in young children's social-cognitive development (Chandler & Fritz, 1989; Chandler & Hala, 1989; Flavell, 1985a). Such attempts to push back the age of qualitative change have had two significant consequences.

First, in the search for evidence of earlier and earlier epistemic competence, researchers have tended to throw their finds, in the form of perspective taking or epistemic tasks at which young children succeed, over their shoulders and continue their search for tasks with earlier ages of first competence. This has resulted in a growing, but as yet, unexamined midden of young childhood epistemic tasks (Boyes, 1990). It is, at present, an open question whether a "heap" is the best order in which to regard these tasks or whether, upon collective examination, they might be shown to fall into a definable order, in terms of their difficulty or relative order of accomplishment. This order, should it prove out, would be understood to reflect a decalage (Elkind, 1976) in

young children's epistemic competence.

Decalage may be simply defined as an age graded series of tasks all of which measure the same underlying cognitive skill. Research has shown age-related increases in children's abilities to succeed at a number of perspective taking tasks (Gopnik & Astington, 1988; Taylor, 1988; Taylor & Flavell, 1985). However, there is no normative data regarding the ordering of tasks in terms of task difficulty nor the order of acquisition of skills necessary to succeed at such tasks. The primary purpose of this thesis therefore is to chart precisely the epistemic development of young children by illustrating the existence of, as well as specifying the details of the proposed decalage. Such an undertaking will undoubtedly be of assistance in more clearly defining the course and perhaps even the mechanisms of epistemic development from young childhood through into adolescence.

The second major consequence of this search for early competence has been a pervasive de-socialization of perspective taking tasks, even those tasks of a conceptual nature intended to investigate children's knowledge of others which, by definition, ought to be social in nature (Boyes, 1990). That is, the study of social-cognitive development has risen out of the study of cognition without considering the complexities inherent in social interaction. Therefore, a second purpose of this research project involves an initial attempt to re-socialize methodologically an area which belongs within the realm of social-cognitive development but which has been investigated, for the most part, utilizing purely non-social cognitive tasks administered to individual children.

Social-cognitive development normally occurs within an interactional context in which the targeted form of knowledge is knowledge of the other person(s). Perspective taking, like any social activity is not an individual construction but is a joint construction or a co-construction, which is facilitated by the presence of another (Lee, 1989). It is through peer interaction that children gain the concept of perspective and

become increasingly accurate at inferring the thoughts, emotions and wishes of others (Leslie, 1983). Social-cognitive development may be said to originate in human interaction. Within this view, social knowledge exists first on an interpersonal level and is only later transformed into intrapersonal concepts and beliefs (Vygotsky, 1978; Wertsch, 1985). Lee (1989) proposed a positive relationship between the number of social components that are built into any given task and the ability of children to construct an accurate appreciation of the perspective of another. He suggested that what appears to be egocentricity in young children is a function of certain types of tasks, those that are devoid of social content. Boyes (1990) developed a possible framework for understanding the mechanisms by which peer/social interaction interacts with individual cognitive development. He suggested that such interactions be construed as shared performances that are structured mutually and subjectively.

In spite of these views there has been no attempt to apply a social corrective to what are viewed as purely autonomous cognitive tasks and the bulk of the research has focused on the individual child, not on children interacting in a social context. Some tasks (Chandler, Fritz & Hala, 1989) involved an acknowledged interaction between experimenter and subject, but this was not a focal point of the research. It appears obvious then that there is a need to focus upon the interactional component inherent in social-cognitive research by imbedding the testing situation more firmly within a natural social context methodologically. The view taken here is that peer/social interaction may be conceptualized as a "training ground" within which children gain valuable experience and from which they emerge better equipped as individuals to grapple with the essentially recursive nature of social interaction.

Two primary tasks are central to this project: a) to describe a quantitative developmental continuum leading away from what has been accepted as a qualitative shift in development; and, b) to make a first attempt at re-socialization of the task

environment to determine the interactive effect of children's existing epistemic competence, social interaction and the impact this has on their beliefs about the source of knowledge. To accomplish these tasks it is first necessary to review the role-taking literature.

Research in perceptual role-taking began with Piaget's egocentrism hypothesis. More recent developmental research has demonstrated children's tendencies toward intellectual realism and their difficulties with the appearance-reality distinction. These topics will be examined first followed by a review of the research investigating children's conceptual and emotional role-taking abilities. Subsequent to a review of this literature will be a description and critique of current theory relevant to the development of social knowledge in children and the presumptive cognitive epistemologies thought to underlie this knowledge. Two theories which describe how this developmental process is thought to unfold will be examined, the connections-representations theory (Flavell, Green & Flavell, 1988a) and the constructivistic theory of mind (Chandler & Boyes, 1982). It is this body of empirical research and theory which provides both the impetus and rationale for the present research.

This literature review will accomplish three main objectives:

1. It will document the existence of a qualitative shift in children's developing theories of mind and will illustrate how this shift has been variously conceptualized for example by Piaget (1929), Flavell, Green and Flavell, (1988a) and Chandler and Boyes (1982).

2. The following section will highlight the existence of the proposed quantitative continuum as evidenced by children's age-related differences in perspective taking abilities. The existence of such a decalage is the natural result of past research in the field and is implicit in the literature.

3. Finally, this review will demonstrate the need for methodological modification

in research investigating children's social-cognitive development. Specifically, the demand for re-socialization of the task environment

Perceptual Role-Taking

As noted, the origins of contemporary research investigating children's perspective taking abilities can be found in the early work of Jean Piaget. Therefore it is appropriate to begin with a treatise on his empirical research and theory.

Piaget and Egocentrism

Piaget introduced his concept of egocentrism in Europe as early as the 1920's although it had little impact on North American developmental psychology until the 1960's. He proposed that young preschool children are essentially egocentric in both social situations and individual thought patterns. They lack the very idea of perspective and thus appear unable to differentiate other's perspectives from their own; appear to focus on their own point of view to the neglect of others.

The origins of Piaget's egocentrism hypothesis, found in his early theory regarding the epistemic development of young children (Piaget, 1929), was initially taken to be demonstrated by the results of a study undertaken by Piaget and Inhelder (1956) involving a table-top papier-mache model of three mountains. Their data showed that when asked to construct from a set of 2-dimensional cut-outs of mountains, a representation of the view of the mountains as it would be seen from the perspective of a doll positioned such that it "saw" a different aspect of the array from what they themselves saw, children typically constructed a representation of the mountains which matched their own view. A series of subsequent studies designed to investigate children's ability to appreciate that others may see the same object or array differently as a function of their point of view revealed similar results.

Piaget concluded that young children are essentially unable to consider the very idea of perspectives, their own or others (Pillow, 1988) and this led to their being

labelled as egocentric. According to Piaget, older more cognitively sophisticated children were characterized by decentration. He proposed that the major developmental task of early childhood was to overcome this essential egocentrism by gaining the concept of perspective and argued that this was accomplished through social interaction with peers (Light, 1983). He felt that it is through peer interaction that children develop the capacity for sensitive perspective-taking in their interpersonal relationships (Rubin & Mills, 1988). Piaget suggested that social experience stimulates and challenges children because it contradicts their expectations and results in cognitive disequilibrium, especially due to their lack of any notion of perspective. Children are then motivated to utilize their newly attained cognitive capabilities to resolve the cognitive dissonance (Hoffman, 1988). Piaget proposed that not only was social experience of primary importance for children's cognitive development but that the fundamental cognitive structures underlying both social and non-social development were similar and developed concurrently (Light, 1983).

Irrespective of the fact that Piaget's research utilized primarily visual perspective taking tasks and did not appear to be truly "social" in nature, it seems apparent from the hypotheses he proposed and the broad conclusions he reached, that his intention was to describe not only the visual perspective taking abilities of children but the developing child's understanding of thoughts, feelings and motives of others, in essence, children's theories of mind (Light, 1983). However, in spite of Piaget's belief in the importance of social interaction, he tested children individually, never exploring the extent that disequilibrating experience might have on social-cognitive development.

Concurrently with the development of his egocentrism hypothesis, Piaget described a series of distinct social-cognitive developmental stages in which he argued for a qualitative difference in the way that young children conceive of and interact with their mental and physical worlds in contrast to the way in which children in middle

childhood perceive of the world and the workings of the mind. The response to Piagetian theory was highly volatile, stimulating much debate. Critics argued over whether or not there were any qualitative differences between young children's presumptive epistemologies and the theories of mind held by older children. They also disputed the approximate age proposed by Piaget for the shift, should it even exist.

The upshot of this controversy was numerous studies designed to: a) discredit the notion of any distinct qualitative change in cognitive development at least in the late-early to middle childhood years; and, b) push back the age at which the particular skills or abilities exist and so find evidence of visual, conceptual and emotional perspective taking in ever younger children. Tasks were simplified and children trained to the tasks in order to investigate specific competencies with the result that certain specialized skills and abilities have been discovered in very young children (Flavell, Flavell & Green, 1983).

This type of research is considered to be problematic for a number of reasons. It has been directed by and supports an "either - or" description of the perspective taking skills children possess at different ages which appears to argue that children either have the particular skill or they do not. This has eventuated in a number of relatively disconnected, fractional approaches to the area which describe a series of equally disjointed skills and abilities in a dichotomous manner. The attempt to discredit Piaget's concept of distinct qualitative shifts in development by pushing back the age boundaries at which such a shift may occur, or attempting to eliminate them altogether by zeroing them out, has resulted in conceptualizing differences in perspective taking abilities solely in terms of quantitative variation across an increasing number of separate content areas. Such a research orientation also focused on individual children's competence out of any social context, essentially ignoring the disequilibrium created by peer interaction during transitional phases of development.

Intellectual Realism

Consistent with a Piagetian account of development, young children's errors on visual perspective taking tasks, i.e. their inability to correctly report what others have seen, has traditionally been considered as evidence of their cognitive egocentrism. Such a position rests on the presumption that children can select from the range of possibilities the appropriate representation of their own view. This presumption has been challenged on the grounds that children have been found to err with respect to their own view selection during pre-testing and task instruction, confusing the pictorial representation of another's view with their own (Liben, 1978). Research motivated by such a challenge gave rise to the concept of intellectual realism; that is, the inappropriate representation of that which is known to exist even though the object(s)/event(s) may not be presently in view.

Liben (1978) investigated the perspective taking abilities of children aged 3 to 7 to determine whether difficulties encountered could be a function of the inherent representational and spatial demands of such tasks, in addition to their perspective taking components. She hypothesized that competency in perspective taking would be evident earlier i.e. at a younger age in tasks that lacked complex representational and spatial demands. Her data revealed that young children could not correctly select or answer questions about their own view on complex perspective taking tasks consistently until about age 6. Liben (1978) suggested that given this inability, difficulties encountered when selecting/answering questions about another's view cannot be due entirely to cognitive egocentrism or the inability to decenter.

Liben (1978) proposed that such a pattern of responding may be due to children's tendency toward intellectual realism. It may be more difficult for young children to differentiate their own knowledge of an object/event from another's (inferred) perception of the same object/event than it is to keep separate their own

knowledge from their own perception, especially if they believe that the knowledge is "out there" to be seen. Of particular significance to the present study is that it appears evident that errors in such tasks, previously assumed to be the result of children's inherent cognitive egocentrism, may be due to the child's privileged knowledge base and the difficulties encountered when asked to suppress such knowledge in light of their own, or another's, incomplete perceptual information.

In a follow-up study Liben & Belknap (1981) examined the viability of the hypothesis that the propensity toward intellectual realism adversely affects children's performance when asked to select pictorial representations of visual stimuli. They proposed that such a tendency transforms a relatively simple perceptual task into a complex one.

Liben and Belknap (1981) found that even very young children were able to select the appropriate pictorial representation of their view of simple arrangements. When there was a match between what was known to exist and what could be perceived, intellectual realism did not appear to hinder performance (Liben & Belknap, 1981). They concluded that young children have difficulty discriminating what they know to exist from what they actually see. This data was considered to be a clear demonstration that mistakes made in visual perspective taking tasks could be motivated by children's inability to discriminate their own knowledge from their own visual experience. If this inability to discriminate what they see from what they know underlies problems in "own" view selection, it appears reasonable to suggest that the same difficulty underpins children's inability to infer another's viewpoint in a visual perspective taking task and is not merely the result of cognitive egocentrism or the inability to decenter.

Subsequent to these studies, children's perspective taking skills began to be considered within the broader context of their functional epistemological development. In 1983, Light and Nix challenged traditional interpretations of children's apparent

preference for selection of own view pictorial representations in visual perspective taking tasks. They proposed that since children are generally given a clear view of any particular object or array, in essence a privileged position, this tendency may be a reflection of their preference for a "good" view, rather than "own" view. Children may consider any view of an array which shows all the objects clearly to be the correct, and therefore preferred, view.

Light and Nix (1983) suggested two over-riding principles of selection employed by children: a) choose a photograph which shows the complete array, i.e. all the objects clearly; and, b) if there are several that show the array equally well and your own is among them, choose your own view. They suggested that own view preference is a secondary phenomenon, overridden by concern for a good view.

An alternative explanation is equally plausible. In most investigations of perspective taking, children are initially given the opportunity to view the array from all perceptual locations and therefore have full knowledge of what actually exists in the array in spite of their own or another's limited perceptual information from the other locations. They may therefore encounter difficulty suppressing that knowledge or distinguishing it from the immediate appearance of the array. That is, they may not know that they have the knowledge and assume instead that it is "out there" for all who have eyes to see. Such a "seeing = knowing" mode of operating, also referred to as "copy-theory" of knowledge appears to be characteristic of very young children, as subsequent research in this area has shown (Boyes, 1982; Chandler & Boyes, 1982; Taylor, 1988).

Appearance-Reality Distinction

Young children's apparent difficulty to distinguish appearance from reality has been extensively investigated over the past decade. Included in this review is empirical literature considered to be representative of the theoretical orientation and

methodological direction taken in the area.

Flavell, Flavell & Green (1983) investigated young children's ability to distinguish appearance from reality within the context of both object identity and object property (colour, size). Children aged 3 to 5 years were presented with illusory stimuli that was extremely realistic in appearance. Examples included: a) a sponge that was made to look like a rock; b) a rock shaped and painted to resemble an egg; c) a white object such as a fish that looked blue when viewed through a filter; and, d) a rock that appeared bigger when viewed through a magnifying glass. Having first allowed children an opportunity to establish the true identity or property of the stimuli, they were then asked to report: a) what the object looked like to their eyes "right now" (appearance); and, what the object identity or object property really and truly was (reality).

Flavell et al. (1983) found that although some children as young as 3 years appeared to possess a rudimentary grasp of the distinction between real and apparent identity or property, this ability was highly unstable and poorly consolidated. Children of this age systematically made two types of errors. They tended to be "phenomenists" when asked about object properties. That is, when questioned about object properties, 3 year olds said that the stimuli not only appeared to be the colour/size it presently was but it really and truly was that colour/size; a phenomenistic error pattern. For example, when asked what colour the white fish really was, (it appeared blue when viewed through a filter) children said that not only did it look blue but that it really and truly was blue. When questioned about object identity, including object presence, absence and action, children were "intellectual realists". They tended to report, incorrectly, that the stimulus presently looked like what it really and truly was (Flavell et al., 1983). Thus, the rock shaped and painted to look like an egg was reported not only to resemble an egg but to be an egg. This tendency toward intellectual realism is similar in kind to the type of errors children made in Liben and Belknap's

(1981) study with regard to what objects are actually present in an array versus what objects are presently in view.

Flavell et al. (1983) suggested that given their propensity to discover what really and truly exists in spite of appearances, children may overdo this tendency in an experimental situation to show that they really know what object is truly there. Alternatively, young children may define object properties in terms of the immediate perceptual appearance of the object. That is, how it looks to them right now is how it is right now. Children may not be adept at distinguishing between and simultaneously integrating information from two different sources, i.e. their perceptual information and their knowledge states (Flavell et al. 1983).

A recent series of studies undertaken by Flavell, Green and Flavell (1986) designed specifically to simplify the tasks in terms of: a) verbal demands; b) lighter memory load; c) making increased perceptual cues available; and, d) providing specific training to the task, did not show any significant improvement in young children's performance. Although the tasks were easier from an information processing standpoint, 3 year olds continued to make almost as many of and the same types of errors as they did on more difficult tasks. This was taken to indicate a lack of understanding of the distinction between appearance and reality (Watson, 1986).

Flavell et al. (1986) concluded that children 3 years old and younger are "unable to" or "incapable of" reporting how a stimulus presently looks to them and what that stimulus really and truly is (or really and truly looks like) continguously in time. Children of this age simply do not have the capability to grasp and maintain this distinction. Two possible explanations were proposed for children's poor performance in appearance-reality tasks: a) children may form only one representation of the stimulus and report that representation no matter which question is asked (identity or property) hence their consistent phenomenistic or intellectual realism error pattern;

or, b) conflict may be created by the cognitive demands of attributing mutually incompatible and contradictory properties to the same object and such "dual coding" can only be resolved by identifying and reporting on one representation only. Children " . . . may only focus on and encode which ever one of the two happens to be more cognitively salient at that moment. For them, the stimulus then "is" that one thing" (Flavell et al., 1986, p. 57).

Although the conclusions drawn from the research detailed above are equivocal there does appear to be agreement on two central issues. First, there is general consensus with respect to the existence of a distinct qualitative shift in children's social-cognitive development. Children characterized by tendencies toward intellectual realism and by difficulties distinguishing appearance from reality are considered to be below this point of qualitative change. Those children not subject to such errors function above the qualitative shift. Second, researchers agree implicitly that there are age-related differences in children's visual perspective taking abilities, as evidenced by their improving skill at perspective taking tasks. Such increases describe quantitative change in children functioning above the point of qualitative change.

There is however, no such agreement concerning the age at which the qualitative shift occurs nor is there consensus with respect to what might underpin, motivate and direct the course of such development. Furthermore, what has not been addressed is the social nature of these tasks. More specifically, the possible effects of the interactive process between experimenter and subject and the impact that this social transaction may have on task performance. It seems quite probable that playing around with the wording of task demands, in essence training children to the experimenter's expectations, while pushing back the age of competence introduces a social component to the task which has been ignored when interpreting results. This social component may indeed play a large part in children's performance.

Conceptual & Emotional Role-Taking

It could be argued that making a distinction between perceptual, conceptual and emotional role-taking is a meaningless endeavour merely referencing different types of task situations and their inherent information processing demands rather than an underlying cognitive mode of interacting with the environment that guides children's performance and forms the basis for particular skills and abilities. Indeed, cognitive abilities such as representation, integration and inference may be seen to be the basis of children's abilities in all three forms of role-taking. As a result, there has been some controversy over the very existence of more than one type of perspective taking and debate over the proposed developmental sequence describing the emergence of role-taking abilities, especially in light of the specific cognitive demands of the various tasks utilized (Kurdek & Rodgon, 1975; Rubin, 1978; LeMare, 1982). However, it is now generally agreed that a single developmental dimension underlies children's role-taking abilities and that competence in perceptual role-taking emerges prior to abilities in conceptual and emotional role-taking. This is consistent with Piagetian developmental theory which described children's progression from an object centred, perceptually orientated way of interacting with the world to a more representational or conceptual mode of knowing (Boyes, 1982).

For the purpose of this literature review therefore, the distinction drawn in the role-taking literature between perceptual, conceptual and emotional role-taking has been maintained, both in the interests of clarity of presentation and in the attempt to more precisely chart young children's evolving social-cognitive development, particularly as both conceptual and emotional role-taking are considered to be more correctly "social" in nature. Conceptual role-taking is defined here as the ability to recognize that other's may have different thoughts than oneself in the same or similar situation, and the ability to infer what those thoughts might be. Similarly, emotional

role-taking is the understanding that others may experience different emotions than oneself given the same situation, the inferential skill to determine what these might be or the realization that people may experience two, or more, possibly incompatible emotions, simultaneously.

Conceptual Role-Taking

It appears evident that young children's skills in perceptual role-taking serve them well when they are asked to take the conceptual perspective of another, i.e. to report on what another does or does not know (Taylor & Flavell, 1985). Marvin, Greenberg and Mossler (1976) found that children as young as 4 were competent in simple conceptual role-taking tasks. Children of this age understood that if another does not see the object that they see, then that person also lacks knowledge of the identity of that object. Three year old children have been found to: a) successfully hide objects from others; b) orient objects correctly for another to view them (Taylor & Flavell, 1985); c) choose an appropriate sized chair for an adult or child; and, d) select a gift suitable for an opposite sexed peer or relative (Zahn-Waxler, Radke-Yarrow & Brady-Smith, 1977).

Chandler & Helm (1984) investigated young children's conceptual role-taking abilities utilizing a series of six single frame cartoon drawings that portrayed a variety of situations, such as a ship coming to save a drowning witch or two elephants extending their trunks to sniff a grapefruit. Children aged 4, 7 and 11 years were shown the complete drawing. The picture was then partially covered so that a severely restricted portion was open to view, revealing only unrecognizable parts. For instance, the triangular prow of the ship and the witch's hat, or the tips of two trunks on either side of a small round object could be seen. Children were then asked to predict what another child, who would be shown the restricted view only, would think was being depicted. Thus children were required to set aside their own complete privileged information in

order to assume the conceptual perspective of a peer with severely limited perceptual information.

Chandler and Helm (1984) found that 4 year old children reported that the naive observer would be able to identify the objects in the picture given only the view of the nondescript parts. Chandler and Helm (1982) concluded that for children aged 4 and under, seeing an object equals knowledge of that object, and anyone seeing even a restricted indistinguishable part of the same object they see shares their knowledge of it.

Taylor and Flavell (1985), tested the seeing=knowing hypothesis using a modified version of the Chandler and Helm (1982) task. Children in three age groups, young 4 year olds (mean age 4 yr. 1 mo.), older 4 year olds (mean age 4 yr. 10 mo.) and 6 year olds, were shown pictures portraying a restricted view of two objects. Children were first asked to guess what the objects in the pictures were. Then, after being shown the full picture they were asked to predict what another child would know about the identity of the objects depicted from looking at the restricted view only. The modification introduced by Taylor and Flavell (1985) consisted of varying the amount of information in the restricted view across trials, in an attempt to determine the extent to which children based their predictions about another's knowledge on the information actually given in the restricted view. Four restricted views were presented, consisting of: a) a blank frame, no information; b) a tiny edge of one object; c) a larger but still indistinguishable portion of one object; and, d) an unrecognizable part of both objects. For all four restricted views children were specifically asked "Can (name of child) tell there is a witch/ship in the picture?"

Taylor and Flavell (1985) found that older 4 and 6 year old children appeared to base their predictions more on the amount of information the naive observer had access to than on their own knowledge when compared to younger children. Young 4 year olds

consistently claimed that the tiny edge or small non-descript part of the object was sufficient to allow identification. When the restricted view was a blank frame none of the children attributed any knowledge to the naive observer.

Taylor and Flavell (1985) suggested that this pattern of results supports the seeing=knowing hypothesis; that is, the prediction that young children will attribute full knowledge to a naive observer about an object or objects that are only partially in view. Four year old children quite willingly attributed a great deal of knowledge to an observer who had access to severely limited perceptual information only, apparently assuming the other shared their own knowledge. They concluded that children of this age have difficulty separating their complete knowledge about the object in the pictures from the perceptual information available to the naive observer. Given the above pattern of results it appears evident that there is a gradual quantitative improvement in children's ability to predict what another knows that varies as a function of the amount of perceptual information actually available.

In subsequent studies, Taylor (1988) found that for children 4 to 8 years of age, reporting that a restricted view of an object would be sufficient to allow identification decreased as a function of age. Although 3 year old children tended to respond randomly or show a response bias, they appeared to base their decisions about the knowledge of the naive observer on their own knowledge and not on the available perceptual information. They were significantly more likely to attribute knowledge to a naive observer than were older children. Furthermore, when a training condition was introduced, training brought the scores of 4 years olds up to the level of the six year old children, but did not have much effect on the 6 year olds performance, which was nearly at ceiling. No 3 year olds participated in the training condition.

The training condition gave children the opportunity to discover that identical appearing restricted views could in actuality represent parts of very different objects.

Such insight into the possibility of multiple interpretations of the same visual information appeared to give children in the training condition an advantage over children in the control condition when asked to predict what a naïve observer would know about the identity of pictured objects.

We conceptualize Taylor's (1988) training procedure as essentially a social learning situation which could plausibly occur in children's everyday lives and which provides the experience of being exposed to the idea that another may hold an entirely different perspective, given the same perceptual information. From such experiences children develop an awareness that identical perceptual information can reflect different realities.

In summary, it is reasonable to conclude that pre-school children seem to believe that seeing part of an object is a necessary and sufficient condition for identifying the object, providing some support for the seeing=knowing hypothesis. This does not imply that such children necessarily assume that a person who shares their visual perspective also shares all their knowledge about the object. Furthermore, children 4 years and older appear to have acquired the understanding that people, not objects, are the repositories of knowledge. They know that one can hold a false belief, can be unwittingly misled by the available information or deliberately deceived by another person. Children of this age are aware that one can know something and not be in possession of complete knowledge, that it is possible to have some knowledge and hence hold a belief with respect to that knowledge based on incomplete or limited information. They understand that reality and one's beliefs about reality are not necessarily the same (Chandler & Fritz, 1989; Wimmer & Perner, 1983; Perner & Wimmer, 1985; Hogrefe, Wimmer & Perner, 1986; Moses & Flavell, 1988). Finally, there also appears to be abundant evidence for an ontogenetic increase in performance when children are asked to predict another's knowledge based on the available perceptual

information.

A recent challenge to the traditionally accepted position that until they are 4 years of age children are unable to appreciate the possibility that they or others may subscribe to a belief "not rooted in reality" (Chandler & Fritz, 1989, p. 3) has been put forward by Chandler and his colleagues (Chandler & Fritz, 1989; Chandler, Fritz & Hala, 1989; Chandler & Hala, 1989;). Operating on the premise that even 2 1/2 to 3 year old children understand the possibility of false beliefs and that reality and one's beliefs about it need not be the same, Chandler et al. (1989) suggested that such children may therefore be said to possess a legitimate theory of mind, however developmentally immature or unsophisticated it may appear. Chandler et al. (1989) argued that the now classic "unexpected change" procedures, originally developed by Wimmer & Perner (1983) and now commonly used to measure children's understanding of deception and false belief, are computationally and verbally too complex for very young children, taxing their information processing capabilities and hence underestimating their degree of understanding of such mentalistic phenomena. (Details of a typical unexpected change procedure are outlined in Appendix A).

In a series of studies, Chandler et al. (1989) involved subjects in a hide and seek game in which the object and indeed the only way to win was to actively undertake to deceive their opponent with respect to the location of a "treasure". They suggested that if children could be shown through their actual behaviour to plan and to take the necessary steps to disinform another about something (i.e. the location of an object) that the other understands to be a true state of affairs, they could do so only if they understood that the other could be led into a false belief. Such behaviour would then constitute evidence of a fledgling theory of mind (Chandler & Fritz, 1989).

Chandler et al. (1989) found that almost all subjects behaved according what they termed a "rational assessment strategy" (Chandler & Fritz, 1989, p. 19). That is,

children predicted that their opponent would search in one or more of the locations subjects had deceptively arranged to appear to be the most obvious hiding place and not where they had actually hidden the treasure. Chandler et al. (1989) concluded that even the youngest subjects gave evidence of understanding that their efforts to deceive led their opponent into holding a false belief. They argued therefore that: a) because subjects actively attempted to deceive and disinform their opponents about the actual hiding place where they had hidden the treasure; and, b) since they appeared to realize that they had instilled a false belief about the actual location through their actions, these very young subjects could be said to hold a "fledgling but real theory of mind" (Chandler & Fritz, 1989, p. 20). Children in this study were in active collaboration with an adult research assistant who provided directive clues as to how best to proceed. This undoubtedly introduced a social interactive component to the study which quite reasonably could have had some influence on the children's behaviour. It is our contention that the majority of everyday situations naturally include such a social component and that this should be built in to the design of research projects to more accurately reflect young children's social-cognitive learning environment.

The fledgling theory of mind (Chandler & Fritz, 1989) subscribed to by very young children quite probably goes through a series of qualitatively distinct changes as well as quantitative modifications. In addition, there is some evidence to indicate that it is not until middle childhood that children develop an awareness that what appears to be an identical stimulus can in fact turn out to have many different meanings or realities (Chandler & Boyes, 1982; Chandler & Fritz, 1989; Taylor, 1988). What appears evident however, is that few, if any, of the currently employed conceptual role-taking measures have succeeded in telling us anything about pre-school children's ability to grasp the notion of the possibility of a "one-many" relation between objects/events in the world and the numerous humanly constructed possible realities (Chandler & Fritz,

1989). What seems necessary to correct this deficit is the introduction of peer/social interaction into traditional role-taking measures to determine the influence of exposure to another's reality.

Emotional Role-Taking

The emotional role-taking literature is less comprehensive and, to some extent, the conclusions drawn parallel those arrived at in the conceptual role-taking literature. What follows therefore is a relatively short section sampling representative emotional role-taking research. With respect to emotional role-taking, young children appear to be aware that others have emotions and that these may be situationally dependent (Borke, 1971). Children 4 years of age are capable of distinguishing real from apparent emotion (Harris, Donnelly, Guz and Pitt-Watson, 1986). There is evidence of a gradual age-related increase in children's ability to take another's prior experience into account when interpreting their emotional reaction to an event (Gnepp and Gould, 1985).

As was the case with the conceptual role-taking literature there has been some controversy over the validity of these results. Such debate was based primarily on the contention that evidence of children's emotional role-taking skills at such young ages was the result of their referencing how they themselves would feel in the highly familiar situations introduced in the above tasks, and was therefore not true role-taking (Chandler & Greenspan, 1972). It is now generally agreed however, that competence in these areas is evident at much younger ages than had been previously proposed (i.e. ages 3 or 4 as opposed to 6 or 7). Depending upon the theoretical orientation of the researcher, the specific types and complexity of tasks utilized and the resultant cognitive demands they impose, children appear to be aware of the differing conceptual and emotional perspectives of others as young as age 3, become increasingly sensitive to these perspectives and more accurately infer the cognitions and emotions of others as

they develop (Boyes, 1982).

In summary, the presently existing state of our understanding of young children's perceptual, conceptual and emotional role-taking abilities appears to be as widely spread as the diverse theoretical orientations and investigative methodologies utilized to study such skills. It would appear that our knowledge in this area, while certainly informative, is less than concrete and opinions held are, if not openly controversial, for the most part open to considerable debate and distinctly unconsolidated. We would reiterate however, that there is general consensus with respect to the existence of both a qualitative shift in children's social-cognitive development as well as age-related quantitative increases in children's perspective taking abilities. With the exclusion of Taylor's (1988) training study however, the importance of the social context has been largely ignored and there is no empirical research which was specifically designed to investigate the impact that social interaction might have on young children's social-cognitive development.

This selective review was intended to convey the essence of the investigative orientation and the conclusions drawn from past research. (For a comprehensive review see Shantz, 1985). What follows in the next section is a critical review of two theories relevant to children's developing theories of mind. The present research builds upon and is the natural extension of the theoretical efforts and trends to be described.

Theories of the Epistemic Development of Young Children

The theories presented in the following section will be discussed and referred to as "developing theories of mind" or alternatively as the "functional epistemologies" of young children. The current trend within the social-cognitive developmental literature is to consider children's increasingly sophisticated capabilities in the various forms of role-taking from the more comprehensive perspective of their beliefs about the source and accessibility of knowledge and meaning, that is, children's epistemic beliefs.

Until recently, few attempts have been made to integrate these diverse areas to describe a developmental trend or to argue that abilities evident at particular ages may be taken as evidence of underlying fundamental changes in children's developing theories of mind. There are indications however, both within the perspective taking literature and in reflections upon the field of developmental psychology more generally, that more utility is being found for the notion that cognitive developmental achievements across a variety of content domains may, in fact, be underpinned by more general cognitive structural shifts (Astington, Harris & Olson, 1989).

Connections-Representations Theory

Flavell, Green & Flavell (1988a) proposed what they term a connections-representations theory to describe and explain the course of children's social-cognitive development and to account for children's inferential abilities; "their newly acquired insight into the nature of the mind" (Flavell et al., 1988a, p. 3). Flavell et al. (1988a) claimed that by approximately 3 years of age most children know that they and other people can be cognitively connected to things in the external world in various ways. That is, they can see an object, hear the sound it makes, smell it. They can imagine, dream, fear and be angry about objects or events. Children of this age also know that these connections can change with time, are independent from one another and from those of other people and that they entail inner, subjective experience (Flavell et al. 1988).

Flavell et al. (1988a) proposed that what 3 year olds tend not to understand is that forming a cognitive connection to things involves mentally representing those things. Although children believe that an object has only one basic nature at any given point in time, they don't understand that it is possible to mentally represent an object in several different and possibly contradictory ways; that a thing may be only one way in the external world at any given time, but may be more than one way in their own and other's mental representations of it (Flavell et al, 1988a).

Flavell et al. (1988a) argued that children develop an understanding of connections prior to an understanding of representations. This claim closely parallels Flavell's (1974) hypotheses regarding the distinction between Level 1 and Level 2 knowledge states and the acquisition of the appearance-reality distinction in young children (Flavell et al., 1983; Flavell et al., 1986). The connections-representations theory is the natural extension of and builds upon theoretical and empirical efforts in this area. Therefore, a brief review of these concepts is appropriate to more fully understand the orientation of this research.

Specific to children's developing knowledge and abilities in visual perspective taking and role-taking, Flavell (1974) described two distinguishable developmental stages; Level 1 and Level 2 knowledge states. Children at Level 1 can infer what objects can or cannot be seen from another person's perspective or viewpoint. This fundamental insight, evident in 2 to 3 year old children, consists of the simple awareness that another person may not always see the same object that they themselves see. At Level 2, children 4 to 5 years old know not only what another person sees, but also that the same object or group of objects presents a different appearance to others who may be viewing it from another perspective. Children of this age are capable of symbolic representation and understand how an object may appear from a different spatial location.

With regard to the appearance-reality distinction mentioned above, Flavell (1986) proposed that the relation between how things presently appear to our senses and how they really are is a "distinction which probably provides the intellectual basis for the fundamental epistemological construct common to science, "folk" philosophy, religion and myth, of a real world underlying and "explaining" the phenomenal one" (Flavell, 1986, p. 418).

The essence of Flavell's proposal was that children 3 years old and younger consistently equate appearance with reality, i.e. they are unable to distinguish real

versus apparent object identities or object properties. He identified two typical error patterns outlined earlier in the literature review, phenomenism and intellectual realism, which characterized young children's abilities on appearance-reality tasks. Although during pre-testing, children may have displayed clear understanding of such concepts as "looks like" and "really and truly is" and appeared able to manipulate these mentally, their actual performance in testing situations did not confirm competence in this area. They seemed to lack the cognitive capabilities necessary to make the distinction (Flavell et al., 1986).

Flavell et al. (1988b) argued that one of the most important things children must acquire during their social-cognitive development is a clear distinction between external objects or events and their own internal representations of these objects. Without knowledge of mental representations children would be incapable of reflecting on their own or other people's perceptual, conceptual or affective perspectives. They would be incapable of social role-taking (Flavell et al., 1988a). The data from numerous studies has indicated that the acquisition of competence in appearance-reality tasks is directly related to and parallels the acquisition of Level 2 knowledge. Indeed, there is considerable evidence that children 3 years old and younger perform poorly on both appearance-reality tasks and Level 2 perspective taking tasks (Flavell et al., 1988b).

The developmental parallel between these two conceptually related competencies is well established and is not at issue here. Moreover, in the language of Flavell et al.'s (1988a) connections-representations theory it seems reasonable to assume that children acquire some basic knowledge of cognitive connections during the first three years of their lives but do not understand a great deal about the process of mental representation that these connections involve. What has been alluded to but not satisfactorily explicated in this theory is the process of transition from the

understanding of connections to a knowledge state that allows full comprehension of the admittedly esoteric world of mental representation.

Flavell et al. (1988a) suggested that an age-related increase in information-processing capacity might facilitate this transition (Flavell et al., 1988a). As children become able to hold more than one representation in mind simultaneously, they may become able to consider that an object may be mentally represented in different ways. While perhaps a necessary functional pre-requisite for representation, merely being capable of holding multiple mental images in mind at the same time is not sufficient explanation of the developmental course leading to an understanding that the same object can not only be represented in various ways by oneself, but may also be represented differently by others. In order to truly count as adult competence, this newly acquired information-processing capacity must be accompanied by the realization of the possibility for a seemingly infinite variety of alternative identities or meanings that could be subjectively attached to objects or events. The simple capability for mental representation does not guarantee this sophisticated form of inferential ability.

Constructivistic Theory of Mind

It seems apparent that there is some fundamental maturation of the cognitive epistemologies of young children that underpins: a) the realization that there are innumerable possibilities for mental representation given the same perceptual information; b) improved perspective taking skills; and, c) increased sensitivity in social role-taking. In light of this it is evident that prior research attempts to determine when children first acquire role-taking abilities were misguided, merely skirting the real issue (Chandler & Boyes, 1982). What was deemed necessary is an understanding of the transition process in terms of the modes of knowledge of which children are capable and given this particular mode, the knowledge they attribute to and the types of knowledge they are capable of understanding in others. A theory proposed by

Chandler and Boyes (1982) based upon the above mentioned theoretical orientation was an attempt to make some sense of the larger developmental picture; to imbed the diverse content areas and disjointed fragments into a comprehensive gestalt that more clearly describes the acquisition and the changing nature of children's theories of mind.

Chandler and Boyes (1982) described three qualitatively different modes of children's ways of knowing, which were understood to follow from the ordered sequence of cognitive developmental stages proposed by Piaget; pre-operational, concrete operational and formal operational stages of thought. As noted above, Piagetian theory holds that children essentially construct their knowledge of the world through active interaction with it. According to Chandler & Boyes (1982) children's particular style of interacting with their world is seen to evolve and mature as the result of their increasingly complex and sophisticated theories of mind. The proposed sequence defines the ways in which children at different cognitive developmental levels know. What follows is a description of the three modes of knowing of which children are capable, the implications involved for children's comprehension of knowledge in themselves and others and the resultant social role-taking competences evidenced in children operating from these proposed levels.

The first level of this sequence involves a pre-symbolic form of knowing about and acting upon the world. In this stage, children's ways of knowing takes material external reality as the object of knowledge. Knowledge is seen to exist in the world and not within the knower. A pre-symbolic way of knowing is characteristic of children in the pre-operational stage of cognitive development. Concrete operational children, on the other hand, are characterized by a symbolic mode of knowing. In this stage, children are capable of mental representation of the objects and events in the external world which are already known in a pre-symbolic mode. The objects of their thought are still strongly tied to external reality but can be held in mind or conjured to mind without

being physically present. Young adolescents who operate from the third and highest level of the sequence are capable of meta-representational thought. That is, they take as the objects of thought their own second-order representational knowledge. They are capable of thinking about their own thoughts and thought processes. Thus, children are capable of: a) knowing things in action; b) of symbolically expressing their concrete knowledge; and c) knowing that they know (Chandler & Boyes, 1982).

It follows from this proposed sequence that whenever the target of children's knowledge is the knowledge of others, as is the case in a role-taking situation, these same modes or levels of knowledge are the targets of children's knowledge. Chandler & Boyes (1982) suggested that the process of role-taking be thought of as a transactional process in which children operating from one of these distinct modes of knowing attempt to understand any one of these three forms of knowledge in existence in others. What this implies is that children characterized by either a pre-symbolic or symbolic mode of knowing are restricted not only by their own knowledge but also by their way of knowing. As a result, children capable of pre-symbolic knowing are only able to understand pre-symbolic forms of knowledge in others. Those children capable of a symbolic mode of knowing can reliably understand and distinguish between both pre-symbolic and symbolic forms of knowledge in others, but not meta-representational knowledge. Young adolescents operating from a meta-representational level are able to comprehend and differentiate all three modes in others (Chandler & Boyes, 1982). Any attempt to comprehend a form of knowledge in another person which is of a more complex nature will be constrained by the boundaries imposed by the mode of knowing of which an individual is himself capable.

It is precisely because the essence of any social role-taking situation involves understanding how (i.e. in what mode) another perceives, interprets, feels, that what may appear to an observer as egocentrism is in fact the inability to comprehend the

particular mode of knowledge the other is employing. Specifically, any targeted form of knowledge that is more complex or of a higher level will be misconstrued in terms of the mode of knowledge of which the knower is capable. (Chandler & Boyes, 1982). Within the context of social and interpersonal interactions, pre-operational children who have not made the clear distinction between their own pre-symbolic cognitions and their material referents, do not appreciate that others operating from a symbolic or meta-representational mode do make this distinction. Young children treat the symbolic representations of others as the unavoidable consequence of actual physical exposure to material objects or events. The same types of categorical errors are made by concrete operational children when attempting to understand the knowledge of other's capable of a meta-representational mode of knowing. They understand others according to their own characteristic mode of knowing. Egocentric errors or failures in a role-taking situation may therefore be interpreted as categorical mistakes or confusions (Chandler & Boyes, 1982).

These three modes of knowing, it has been argued by Chandler & Boyes (1982) reflect three distinct functional epistemologies. The functional epistemology of pre-operational children, constrained within the parameters of a pre-symbolic mode of knowing and taken to be a reflection of pre-operational thought structure is described as a "copy theory" of knowledge. " . . . such children seem to proceed as though they believe objects to transmit, in direct-line-of-sight fashion, faint copies of themselves, which actively assault and impress themselves upon anyone who happens in the path of such "objective" knowledge (Chandler & Boyes, 1982, p. 391). Knowledge is considered to be objectively given, that is to have its origins in the things to be known, not in the knower. Young children tend to equate their own subjective experience of an object or event with the objective perceptual experience of it. They assume therefore that anyone seeing the same object/event shares their own knowledge of it. Such a seeing=knowing

understanding of the world (Taylor, 1988) has direct implications for the ways in which young children interact with others in a role-taking situation. Because knowledge is considered to exist "out there" in the external world, the subjective perceptions or interpretations of events by others is not considered. Children holding a copy-theory of knowledge appear to lack any understanding of the fact that perceptual information is subjectively organized and the resultant knowledge actively constructed by the knower (Chandler & Boyes, 1982).

Chandler & Boyes (1982) argued that the transition from a pre-operational to a concrete operational pattern of thought is more than the mere accumulation of improved role-taking abilities or a simple shift from perceptual to conceptual perspective taking as has been previously suggested (Flavell, 1974; Shantz, 1975). Rather it is characterized by the acquisition of an additional higher order mode of knowing and consequently the ability to appreciate such knowledge forms in others (Chandler & Boyes, 1982). They proposed that during the transition period, although they may experience occasional lapses and confuse physical with mental phenomena, children do become increasingly adept at maintaining the distinction between material objects/events and their psychological representations. Their newly acquired symbolic mode of knowing becomes more firmly embedded and the appreciation of such symbolic modes in others increases. The act of knowing is increasingly understood to be a constructive human activity, providing personal meaning to objects and events in the world (Chandler & Boyes, 1982).

Summary. For a number of years research has emphasized methodological detail, specific isolated competencies and skills evident in individual children across a variety of seemingly unrelated areas of social-cognitive development. Attempts to understand and describe children's social cognitive development from a more comprehensive orientation of their theories of mind is once again in vogue. (See Astington, Harris &

Olson, 1989). Copy-theory (Chandler & Boyes, 1982) in particular, appears to be an attempt to recapture the flavour and flamboyant style of Piagetian theory in terms of not merely evidence of development, but the foundations of it. We have perhaps come full circle, surviving research efforts to discredit historical theory in attempts to unearth fragmentary elements of development, to a resurgence of more daring hypotheses and theory that describe children's developing epistemologies within an integrated, comprehensive framework.

Present Research

As is evident from the above review, there has been a great deal of interest in the development of young children's understanding about the source and accessibility of knowledge and meaning which has been accompanied by empirical research investigating children's capabilities within the diverse content areas discussed above. However, research dealing specifically with the impact of children's social worlds upon their social-cognitive development is still necessary. Although we have some concept of the specific skills evident at different ages, it is still unclear: a) what goes on developmentally during the transitional period beyond the point of qualitative change; and, b) how these abilities are related to children's underlying epistemic beliefs.

Research has repeatedly indicated the importance of social experience to stimulate, disequilibrate and confirm children's beliefs about their own knowledge as well as the knowledge held by others (Boyes, 1990; Lee, 1989; Piaget, 1929; Vygotsky, 1978; Wertsch, 1985). Knowledge of the mental worlds of self and others, especially of the boundaries and differences between them, is essential for and dependent upon successful social interaction and effective communication. Furthermore, such knowledge makes a powerful contribution to the healthy social-interpersonal development of children as they move from infancy to adulthood (Pillow, 1988). However, we do not yet have a clear sense of the complexities involved in the reciprocal interaction existing

between young children's epistemic beliefs and peer/social interaction.

The introduction to the present research revealed two tasks that demand attention in order to resolve these discrepancies. The first task is to specify the progression of quantitative change in young children's functional epistemologies beyond the qualitative shift. The second is to make some attempt to capture the flavour of normal peer interaction and imbed the task environment within such a social milieu. The present research therefore has two goals:

1. To describe the task decalage noted above, that is, the natural ordering of tasks along a dimension according to the order of attainment of various concepts. Should such a decalage exist it would provide considerable insight into the mechanisms by which children gain an understanding of their own and other's knowledge as well as their beliefs about the source and accessibility of knowledge and meaning.

2. To make a concerted attempt to begin the task of re-socializing methodologically an area which belongs within the realm of social-cognitive development by enriching the experimental task environment with a social component.

The empirical portion of this study proceeded in two phases. The first phase was designed to determine the plausibility of, and hopefully describe, the hypothesized task decalage (goal 1). The second phase addressed the need for re-socialization of the task environment (goal 2) and was an attempt to determine the effect that peer interaction had on young children's functional epistemologies.

Phase One. In order to describe the proposed quantitative continuum leading away from the qualitative shift and to fill in the transition process to the acquisition of a fully constructivistic epistemology, a series of stimuli following a graduated continuum were developed based on past theory and research in this area. These stimuli were then presented to individual children to establish their order of acquisition.

Data from a short term training study (Taylor, 1988) revealed an age-related

increase in children's ability to predict what an observer, given only restricted perceptual access, might guess an object to be. Such improved abilities are analagous to such children's increasing tendency to spontaneously hypothesize about the number of potential meanings that could be attached to a given object or event. It is proposed that such increases describe a developmentally ordered quantitative continuum and are evidence of the increased sophistication of their inferential abilities and their progress towards a more fully integrated realistic view of the world.

Beyond the history of task refinement in search of earlier evidence of first competence, there is some empirical research which indicates that certain tasks and task stimuli are "easier" for children functioning within a given stage of mental ability to succeed at than are other more complex ones. Gopnik and Astington (1988) administered a variety of traditional appearance-reality tasks to children aged 3 to 5 years who were considered to be functioning within the same stage of cognitive development, to determine whether some types of task materials would prove to be more difficult than others. Their data showed that the task stimuli fell along an ordered hierarchical continuum that corresponded to the number of possible identities or meanings that could be attached to them and that there was an age-related increase in the number of tasks at which children were successful. It appeared that grasping the concept of a simple "either-or" distinction (i.e. the object is either a rock or it is a sponge) was an earlier emerging ability than was the conceptualization of the "one-many" relationship possible between objects in the world and their mental representation(s) (Gopnik & Astington, 1988). In other words, grasping the concept of multiple realities was a more difficult and therefore later developing skill.

Based on the above, the stimuli developed for use in the present study were initially tentatively ordered, not in terms of their inherent information processing demands (which was controlled to as minimal an end as possible), but became more

"difficult" in terms of the number of alternative meanings or identities that could possibly be attached to them, therefore requiring different degrees of inferential ability and perspective taking skills.

Phase Two. In an attempt to take some "first steps" towards socializing the task environment stimuli were presented to pairs of children in this phase. Children although matched for age, in many cases differed in epistemic beliefs (perspective taking skill as determined by a brief pre-test). Subjects were instructed to talk to one another about the possible identities or meanings of the stimuli placed before them in order to:

- a) determine whether exposure to an alternative point of view altered these beliefs; and,
- b) determine if the statements children made about knowledge held by others while in the midst of social exchange, differed from statements they made when tested individually by an adult experimenter.

The hypotheses were:

1. Task stimuli will be ordered along a decalage corresponding to children's improving inferential abilities and perspective taking skills given their functional epistemic level.

2. Based on past research the tasks selected for use in this project were chosen because success (passing) requires at least a transitional mode of knowing. Therefore, those children operating from a copy-theoretic view of the world are not expected to succeed at any of these tasks. Prior research has demonstrated that the majority of three year olds are functionally copy-theoretic (Boyes, 1982; Chandler & Boyes, 1982) and it is predicted that these children will fail at most tasks.

3. Children who give evidence of functioning within a transitional or quasi-constructivistic mode of knowing (i.e. above the point of qualitative change) will pass some or even all of the tasks. Their scores will describe an ordered continuum corresponding to the expected task hierarchy.

4. Peer/social interaction will essentially constitute a disequilibrating experience for children which may have some impact on their functional epistemic level. It is proposed that children's level of epistemic competence will be related to the degree and style of social interaction in which they engage. Furthermore, it is expected that transitional and quasi-constructivistic children may give evidence of some alteration of their epistemic beliefs during the course of social interaction (i.e. only those children who possess a rudimentary awareness of the potential variety of meanings that they and others may attach to objects and events, will be affected by such interaction). It is not suggested that such alteration constitutes any permanent, fundamental change in epistemic competence.

5. To the extent that the standard Piagetian derived account of cognitive development is correct, those children maintaining a copy-theoretic view of the world are not expected to evidence any change in their functional epistemology during social interaction.

Method

Subjects

Subjects were 81 children between 3 to 5 years of age drawn from day care facilities and private homes in Calgary.

Phase One. Forty-three children, 7 female and 8 male 3-year-olds (mean age 3 yr. 6 mo.), 7 female and ten male 4-year-olds (mean age 4 yr. 8 mo.), 5 female and 6 male 5-year-olds (mean age 5 yr. 5 mo.) participated in phase one.

Phase Two. Thirty-eight children, 4 female and 6 male 3-year-olds (mean age 3 yr. 5 mo.), 7 female and 5 male 4-year-olds (mean age 4 yr. 7 mo.) and 8 female and 8 male 5-year-olds (mean age 5 yr. 4 mo.) participated in phase two. Children in this phase were matched as closely as possible for age, but not for sex nor for epistemic competence. It was expected that some pairs would consist of partners who were matched

in terms of epistemic competence and that other pairs would not function at the same level of understanding with respect to their belief about the source and accessibility of knowledge.

Children's participation in the study was voluntary and subject to written parental consent.

Tasks & Materials

1. Transparencies (T1). This task is traditionally used to determine whether children grasp the appearance-reality distinction, specifically object property (Flavell, 1986; Flavell, Flavell & Green, 1983). Materials included three coloured cardboard cut outs of familiar objects, covered by different coloured transparencies, causing them to appear a different colour (disguised form). Cut outs included: a) a yellow witch, covered by a blue transparency therefore appearing green; b) a white dog, covered by a blue transparency therefore appearing blue; and, c) a blue fish, covered by a red transparency therefore appearing purple.

2. Sponge rock (T2). This task tests children's ability to distinguish appearance from reality, specifically object identity (Flavell, 1986; Flavell, Flavell & Green, 1983). A sponge realistically painted to resemble a rock (disguised form) served as the stimulus.

3. Smarties/Crayons (T3). This task has been used to investigate children's developing ability to understand representational change and the concept of multiple realities (Gopnik & Astington, 1989). Materials were a Smarties box which in actuality contained dice or a crayon box that had been filled with peanuts (disguised form).

4. Doodles (T4). This task has been utilized to investigate children's awareness of multiple realities and representational change. It successfully distinguishes between copy-theoretic and quasi-constructivistic modes of cognitive functioning (Boyes, 1982;

Taylor, 1988). Doodles are single frame cartoon drawings portraying a variety of situations. Cartoons utilized included: a) a ship coming to save a drowning witch; b) a witch roller skating; and, c) two elephants extending their trunks toward a single peanut. Pictures were partially covered so that only a restricted portion was open to view, revealing indistinguishable parts (restricted information form).

5. Puzzle (T5). This task has been used to identify children functioning at a quasi-constructivistic level of epistemic development and investigates representational change (Boyes, 1982). Three puzzles, each made up of three pieces, which when viewed in full told a certain story, served as the materials. If one or more puzzle pieces are missing, the story will be significantly different. For instance, the third and last puzzle piece in a given sequence depicts a rabbit running. The preceeding piece depicts a wolf also running. When these two pieces are fitted together it appears that the wolf is chasing the rabbit. The first puzzle piece however depicts a forest fire from which a number of animals are fleeing. When this piece is in place it is apparent that all the animals are running away from the fire and the wolf may not in fact be chasing the rabbit. Children were initially shown only the last two pieces of the puzzle (restricted information form).

6. Story (T6). This task was used by Chandler & Helm (1984) to investigate young children's affective perspective taking abilities and their grasp of representational change. Cartoon puzzle sequences which when viewed in full tell a story which incorporates an emotional component were the materials for this task. For example, one complete sequence depicts a little girl who is sad because her father has gone away in an airplane. Later at home, the postman delivers a parcel to her and she opens it happily. However she begins to cry when she unwraps a toy airplane.

The critical issue to be grasped by subjects is that the gift of a toy airplane, normally considered a happy occasion, becomes an occasion for sadness because it

reminds her of an unhappy experience. Together with the experimenter, children viewed the complete story sequence and constructed the story.

Details of task questions and naive observer questions are included in the procedure section. A hand puppet, "Wile E Coyote, served as naive observer. A Sony TCM-5000EV audio recorder was used to record responses.

Sample task materials are attached as Appendix C.

Procedure

All subjects attending a day care were tested in a room or private area provided by that facility. Children not attending a day care were tested in their homes.

Phase One. Subjects were tested individually and no subject who participated in phase one was included in phase two. Children were initially introduced to a hand puppet held by the experimenter. They were told that the puppet was very sleepy and needed his nap. The puppet was snuggled down onto a pillow to sleep. The experimenter then established in agreement with each child that while the puppet was sleeping he could not hear what was being said, nor see what was going on. Children were then told that they were going to play a game during which the experimenter would show them some objects, that they would talk about these things and that then they would wake up the puppet and ask some questions.

Stimulus materials were placed on a small table in front of the children far enough away so that they could not touch them. The experimenter sat across the table, facing the subjects. Materials were presented first in their disguised or restricted information form. Children were asked the task questions. Stimuli were then returned to their disguised/restricted information form and naive observer questions were asked. Details of task questions for each task were as follows:

T1: After determining that children could identify colours appropriately, they were presented with the stimuli covered by the transparency (disguised form) and asked

"What colour is this witch (dog/fish)?" After responding, children were allowed to remove the transparency and discover the true colour of the object. They were then asked, "What colour is the witch (dog/fish) now/really?" The witch (dog/fish) was again covered with the transparency (disguised form). Children were then asked what a naive observer would think if he viewed the stimuli in its disguised form.

T2: Children looked at the rock and were asked, "What is this?" or "What does this look like?" After responding, children were allowed to play with the "rock" and discover its true identity. They were then asked "What does this look like to you now - a rock or a sponge?" and "What is this really - a rock or a sponge?" The "rock" was then placed away from the child (disguised form) and the naive observer questions asked.

T3: Referring to the box, the experimenter asked, "What is this?" or "What do you think is in this box?" After responding, children opened up the box and discovered its true contents. Subjects were then asked "What is this really?" or "What is in this box really?" The dice/peanuts were then returned to the box, the box was closed (restricted information form) and the naive observer questions asked.

T4: Gesturing towards the doodle, children were asked, "What is this?" or "What does this look like?" or "What could this be?" After responding children were allowed to uncover the covered portion to reveal the whole picture and were asked "What is this?" or "What is happening in this picture?" The doodle was then returned to its restricted information form and naive observer questions asked.

T5: Referring to the puzzle the experimenter asked, "What is happening in this puzzle?" "How is the rabbit feeling?" "How is the wolf feeling?" After telling their story, children were allowed to complete the puzzle and were asked "Now what is happening in this puzzle?" "How are the animals feeling?" "How is the wolf feeling?" The first piece of the puzzle was then removed (restricted information form) and the naive observer questions asked.

T6: After completing the story sequence with the child the experimenter asked, "Does the postman know that she is sad?" "Does he know why she is sad?" After this, all but the last two pieces of the puzzle, which depicted only the crying girl holding her airplane present, and the postman, were removed from view (restricted information form) and the naive observer questions asked.

The experimenter then said "Now we are going to wake up Mr. Puppet and see what he thinks." The experimenter held the puppet (naive observer) while he "looked" at the object in its disguised/restricted information form and then returned the puppet to his pillow to sleep. Subjects were asked "What does Mr. Puppet think?" Details of naive observer questions for each stimuli were as follows:

T1: "What does Mr. Puppet think?" If subjects did not respond or replied "I don't know", the experimenter probed with "Does Mr. Puppet know that the witch is really yellow/the dog is really blue/the fish is really red?"

T2: "What does Mr. Puppet think?" Probe: "Does Mr. Puppet know that it is really soft?"

T3: "What does Mr. Puppet think is in the box?" Probe: "Does he know that there are really dice/peanuts in the box?"

T4: "What does Mr. Puppet think?" Probe: "Does he know that there is really a witch (boat/elephant) in the picture?"

T5: "What does Mr. Puppet think is happening?" Probes: "Does he know about the forest fire?" or "Why does he think they are running?"

T6: "What does Mr. puppet think?" Probes: "Does he know why the little girl is sad?" or "Does he know that her Daddy went away on the airplane?"

Subjects were scored according to a 3 part scoring protocol. Those children who gave full knowledge to the puppet (copy-theoretic) or did not themselves grasp the appearance-reality distinction "failed" the task and were given a score of 1. Children

who gave some, but not all of their own privileged information to the puppet, were considered to be in a transitional mode or quasi-constructivistic and given a score of 2. Children who knew that the puppet, given his restricted information, had no knowledge of the true nature of the stimuli, "passed" the task and were given a score of 3. (Details of the precise scoring protocols for individual tasks are specified in Appendix B). Scores of each subject were reviewed by an independent researcher to establish inter-rater reliability.

Phase Two. Subjects in this phase had not participated in phase one. Children were matched as closely as possible by age in months. Each subject was given a brief individual pre-test utilizing a sub-set of the tasks described above to establish their functional level. (Preliminary analysis of phase one scores revealed that certain stimuli identified children's level of social-cognitive functioning. As noted above, children were not matched according to perspective taking skill as determined by the brief pre-test). Five-year-olds were pre-tested on tasks T3, T4 and T6; 4-year-olds on T2, T4 and T5; 3-year-olds on T1 and T5.

Following the pre-test, pairs of children were told that they would be playing a game in which they would be looking at some things and that together they would talk about these things. A chair was placed outside the door to the testing room and it was explained that one child would wait outside while the other came into the room with the experimenter for a short time. Children were allowed to choose who would wait first. The experimenter then accompanied one child into the room and closed the door. Children were presented with one of the stimuli in its disguised/restricted information form and, similar to the procedure outlined above, allowed to discover its true nature. Stimuli were then returned to their disguised/restricted information form.

The waiting child was brought into the room and the children, one fully informed about the stimuli and the other uninformed about its true nature, were seated beside one

another at a table upon which the stimuli in disguised/restricted information form was placed. Referring to the stimuli, the experimenter asked the children to discuss together what it was or what was happening. Probes were often necessary, particularly with younger children, and took the form of "I want you to talk to each other about what this is" or "Could it be anything else?" or "What else could be going on here?" Children switched roles for the second task. That is, the informed child for the first task was required to wait outside and was therefore the uninformed child for the next task. The procedure outlined for the first task was repeated.

Four and 5-year-olds were given a total of three tasks in phase two. The third task involved replication of the phase one procedure, using the hand puppet as a naive observer. Both children together viewed the stimuli in its disguised/restricted information form, were allowed to discover its true nature and then returned it to its disguised/restricted information form. The puppet was then aroused from his nap and the naive observer questions asked, with the added instruction that children discuss together what the puppet thought.

Some modification of the phase-two procedure was necessary for the 3-year-old pairs. Given their propensity to dislike waiting alone and to even wander off when requested to be the uninformed child, these pairs interacted on two tasks only, in both cases using the puppet as the naive observer, identical to the third tasks for 4 and 5-year-olds. Three year olds did not take turns being the fully informed or uninformed child.

As in the pre-testing procedure, subjects in the different age groups were tested using different tasks. Four year olds pairs interacted using T2, T4 and T5; 5-year-olds, T4, T5 and T6. Three year old pairs pairs discussed T1 and T5. In this way, one task, T5, the puzzle, was common to all age groups. All interactions of phase two were audio-recorded for later transcription.

Results

Phase One. Results in general for this phase support hypotheses 1. Inter-rater reliability of the application of scoring criteria (detailed in Appendix B) was determined by comparing the results of two independent coders attempts to score the responses of 15 randomly selected subjects. Inter-rater agreement was 90 %. Differences were resolved through discussion. In order to establish whether a reliable age-related trend existed within tasks, as well as to test for an overall pattern of age-related performance across tasks, separate analyses were initially performed for each task. These analyses are presented in Tables 1 through 6. Each table represents a 3 (age, 3 years, 4 years and 5 years) by 3 (task performance, fail, transitional, pass) contingency table. In addition, Chi Square tests of association were performed for each task. All Chi Square values were found to be significant. Each analysis is presented separately and individual Chi Square values are reported below.

Task One: Analysis of the object property task yielded a significant association between age and task performance function. Chi Square (4, $N = 43$) = 15.68, $p < .01$. Consistent with hypothesis 2, the majority of 3 year olds, failed this task (11 of 15 subjects, 73.3%), compared to 3 of the 17 four year olds (17.6%) and only 2 of 11 5 year olds (Refer to Table 1). This table clearly reflects the anticipated age-related trend in pass/fail scores and illustrates that the bulk of transitional scores are among 4 year old subjects.

Two common types of error were characteristic of 3 year olds who failed at this task. 1. They failed to make the appearance-reality distinction themselves and replied "It really is a green witch" for a yellow witch covered with blue transparency. 2. Three year olds who did grasp this distinction attributed their own full knowledge to the naive observer, replying "He (the puppet) thinks its really green." Similarly, the majority of 4 and 5 year olds who failed this task were able to distinguish appearance from

reality, but had difficulty separating their own knowledge from that of the puppet, assuming him to possess full knowledge. Transitional subjects attributed some but not all of their own privileged information to the puppet.

Task Two: Chi Square (4, $N = 43$) = 17.85, $p < .01$. Analysis of the data suggested that this task (object identity) was difficult for 3 and 4 year old subjects. However, pass/fail percentages for 5 year olds were identical to T1 results (82% and 18% respectively. Refer to Table 2). Only one 3 year old passed this task (7%) and one was considered transitional. Of the 4 year olds, nearly 18% were transitional, identical to T1 scores. However, fewer 4 year olds passed, (35% compared to 65% passing T1). Examination of the verbal responses of subjects revealed that, similar to Task 1, 4 and 5 year olds who failed at this task could verbally express the appearance-reality distinction, but tended to go on and attribute full knowledge to the naive observer. The most common response for transitional subjects was "He thinks its a rock, but he knows its a sponge" (See Appendix B for examples).

Task Three: Chi Square (4, $N = 43$) = 9.55, $p < .05$. The pattern of fail/transitional/pass for 3 year olds is similar to that for T1 and T2 (Table 3). The pattern for 4 and 5 year olds however, quite obviously differs. More 4 year olds passed this task than T2, 53% compared to 35% and fewer were transitional, 12% versus 18%. Nine percent of 5 year olds received transitional scores on this task in contrast to no transitional 5 year olds on T1 and T2. Only 64 % of 5 year olds passed, compared to 82% for both T1 and T2. Such a pattern suggests that this task differs from T1 and T2 in some way. However the pattern is not consistently "more difficult" as shown by the greater number of 4 year olds who passed this task. Possible reasons for this change in performance pattern across age groups is included in the discussion section below. Performance of the 3 year olds, the majority of whom failed this and other tasks was not affected by this subtle difference.

Table 1

T1: Task Performance by Age

Age	Task Performance			Total
	F	T	P	
3	11	1	3	15
4	3	3	11	17
5	2	0	9	11
Total	16	4	23	43

Table 2

T2: Task Performance by Age

Age	Task Performance			Total
	F	T	P	
3	13	1	1	15
4	8	3	6	17
5	2	0	9	11
Total	23	4	16	43

Note: F = fail; T = transitional; P = pass

Table 3

T3: Task Performance by Age

Age	Task Performance			Total
	F	T	P	
3	12	1	2	15
4	6	2	9	17
5	3	1	7	11
Total	21	4	18	43

Table 4

T4: Task Performance by Age

Age	Task Performance			Total
	F	T	P	
3	11	3	1	15
4	7	4	6	17
5	2	3	6	11
Total	20	10	13	43

Note: F = fail; T = transitional; P = pass

Task Four: Chi Square (4, $N = 43$) = 9.52, $p < .05$. Once again, most 3 year olds failed the task (73%). Somewhat surprisingly, 20% of 3 year olds achieved transitional status. Indeed, the number of transitional subjects across all age groups showed a remarkable change, increased to 24% for 4 year olds and 27% of 5 year olds. The pattern of pass/fail for 4 year olds is similar to that of T2, 35% and 41% respectively. Of the 5 year old subjects, 18% failed, 55% passed. (Refer to Table 4). The notable difference in transitional subjects on this task would seem to suggest that it is in some way different from, not only the first two tasks, but from T3 as well. While it seems reasonable to suggest that it is "more difficult" than previous tasks, the precise way in which it differs is open to considerable speculation and will be taken up below in the discussion section.

Task Five: Chi Square (4, $N = 43$) = 10.92, $p < .05$. As evident in Table 5, 80% of 3 year olds failed this task, 2 were transitional and only 1 passed, similar to previous 3 year old performance patterns. The pattern for 4 year olds is almost identical to that for T4, the only difference being the reversal of pass/fail scores (35% failed while 42% passed). Of particular interest is the fact that no 5 year olds were transitional on this task, and as can be seen in Table 4, approximately equal numbers passed or failed (5 failed, 6 passed). This suggests that for 5 year olds at least, consistent with their pattern on T1 and T2, this task taps an "either/or" type of competence. Either they have the ability or they do not.

Task Six: Chi Square (4, $N = 43$) = 18.53, $p < .01$. This task proved most problematic for 3 year olds, all of whom failed. In contrast to other tasks, the story sequence appeared to confuse 3 year old children who in most cases required a great deal of assistance to attain any kind of understanding of the story, let alone come to any decision about the knowledge of the naive observers. Furthermore, it is plausible that, based on their verbal responses and given the length of the story sequences, this task

Table 5

T5: Task Performance by Age

Age	Task Performance			
	F	T	P	Total
3	12	2	1	15
4	6	4	7	17
5	5	0	6	11
Total	23	6	14	43

Table 6

T6: Task Performance by Age

Age	Task Performance			
	F	T	P	Total
3	15	0	0	15
4	7	4	6	17
5	5	0	6	11
Total	27	4	12	43

Note: F = fail; T = transitional; P = pass

taxed the memory capacities of most 3 year olds. The pattern of fail/transitional/pass for 4 year olds was identical to that for T5; 41% failed, 24% transitional and 35% passed. Worthy of note is that the pattern for 5 year olds was identical to that for T5; no 5 year olds were transitional, 46% failed, 55% passed.

To test more directly the hypothesis that these 6 tasks may be ordered along a hierarchical continuum corresponding to children's improving inferential abilities, a Guttman scalogram analysis was performed on the data. This type of analysis is a method of analyzing the order underlying items on a conceptual scale to determine if their interrelationships satisfy certain conditions which define a Guttman scale.

Guttman scales must be unidimensional. That is, all the component items must measure movement towards or away from the same single underlying object. In this case, movement away from a copy-theoretic mode of operating towards a more constructivistic theory of mind and increased epistemic competence.

Guttman scales must also be cumulative. This means that the component items can be ordered by degree of difficulty. Subjects who respond positively to a difficult item will always respond positively to less difficult items and vice versa. In the present study, it was predicted that subjects who passed more difficult tasks would pass all those tasks which were less difficult. The order of the items of a Guttman scale may be determined by the scaling routine itself according to the percentage of respondents who fail each of the items (free entry). Alternatively, the user may force the order of items according to their expected hierarchy (fixed entry) (Nie, Hull, Jenkins, Steinbrenner & Bent, 1975).

Guttman scalogram analysis produces two statistics to aid in evaluating the scalability of the items. The *coefficient of reproducibility* varies between 0 to 1 and is a measure of the extent to which a subject's scale score predicts his/her response pattern. A value higher than 0.9 indicates a valid scale. The *coefficient of scalability*,

which also varies from 0 to 1, indicates whether the scale is truly unidimensional and cumulative. This value should be above 0.6 (Nie et al., 1975).

Items are selected such that they reflect different positions along a continuum and must be ordinal to the degree of being dichotomous; i.e. they must be divisible into two points, pass or fail, yes or no. The stimuli developed for use in the present study were tentatively ordered, according to the number of alternative meanings or identities that could possibly be attached to them. As such they required different degrees of inferential ability and perspective taking skills. Tasks were scored however, according to the three part scoring protocol described above (See also Appendix B). Therefore it was necessary to establish a cut-off point, below which subjects would be considered to fail, and above which they would pass any particular task. For the purposes of this research, those subjects given a score of 2, (transitional), were grouped with those given a score of 1, (fail).

The rationale for collapsing transitional subjects with those who failed, rather than with subjects who passed was based on the contention that within structural accounts of cognitive development it is somewhat unclear what it means to be "transitional". It is only perfectly clear that subjects are fully competent when they pass any given task. Transitional subjects on the other hand, quite obviously possess only some portion of the underlying competence necessary to pass. Such children grasp only part of the required concepts and therefore cannot be said to have acquired the same level of understanding evidenced in more clearly constructivistic subjects.

As a check against the possibility that grouping subjects in this manner may have introduced some bias in the results, an additional analysis was run collapsing transitionals (score of 2) with passes (score of 3). This did not result in any significant alteration in the obtained scale statistics.

Analysis 1, free entry, transitional = fail: This analysis ordered the tasks in

terms of their pass/fail rates as follows: T1, T3, T2, T5, T4, T6, from least to most difficult. As can be seen from Table 7, the total number of subjects failing each task increased along a continuum, specifically; 20 (T1), 25 (T3), 27 (T2), 29 (T5), 30 (T4) and 31 (T6). With the exception, of the larger gap between T1 and T3, these increases are minimal. Therefore, although the tasks are discretely ordered along a continuum, it is most likely that this hierarchy reflects quantitative, not qualitative change and that all tasks do indeed measure the same underlying construct. They all fall above the point of qualitative change in children's developing epistemologies and measure increasing competence towards a fully constructivistic theory of mind. Overall, a total of 16 children failed every task. A second pass through the data revealed that 12 of these 16 (75%) were 3 year olds; the other 25%, young 4 year olds.

The coefficient of reproducibility = 0.8837, indicating that this order is valid. The coefficient of scalability = 0.6774, indicating that the scale is unidimensional and cumulative.

Analysis 2, forced entry, transitional = fail: The expected order of tasks along the hierarchy, based on the conceptual analysis described above and upon which the tasks were initially selected for inclusion, was T1, T2, T3, T4, T5, T6. Forcing the entry of tasks in this order did not affect the statistical indices to any extent. The coefficient of reproducibility = 0.8760; the coefficient of scalability = 0.6559. The clear insignificance of these differences reflects the fact that based upon overall pass/fail rates these tasks do not vary greatly in difficulty.

Subsequent analyses which involved moving the transitional subjects into the pass category did not effect any substantial change in the obtained scale. The significance of the scalogram statistics are based largely on the 16 subjects who consistently failed all tasks.

Table 7

Hierarchical Ordering of Tasks Based on Pass/Fail Scores: Free Entry

	Task											
	T6		T4		T5		T2		T3		T1	
	F	P	F	P	F	P	F	P	F	P	F	P
Total	31	12	30	13	29	14	27	16	25	18	20	23
Percentage	72	28	70	30	67	33	63	37	58	42	47	53
Errors	0	8	3	4	2	1	3	1	3	1	4	0

Note: Errors refer to reversals in expected pass/fail sequence for individual subjects.

Used to calculate Coefficient of Reproducibility. F = fail, P = pass.

Phase Two. Selection of tasks to be administered during the pre-testing procedure in phase two was based on the results of the scalogram analysis. This analysis clearly indicated an age-related continuum of performance ability. Five year olds passed more tasks and tasks of greater difficulty than either 4 or 3 year old subjects. Three year olds failed the greatest number of tasks overall. In addition, scrutiny of the pass/fail scores on each task for children who participated in phase one made it clear that a few select tasks would establish a subject's level of epistemic competence. Aside from the minor differences with respect to task difficulty and in view of the fact that 37% of subjects failed all tasks, it is evident that level of epistemic competence accounts for the big variance within this age range.

The pre-testing procedure of phase two was not intended as an extension of, nor as a replication of the normative data gathered in phase one. Rather, this procedure was implemented to obtain a baseline measure for subjects in order to determine if pairs of subjects functioned at the same level of epistemic competence. Knowledge of each subject's existing level of competence going into the interactive portion was essential in order to note any change in functional level that might become evident during social interaction.

Each subject's emergent level of epistemic competence (assessment of what occurred during the course of interaction) was based on their responses to naive observer questions, the last task of the social interactive part of phase two. These two assessment procedures were integral to the primary purpose of phase two. That is, to investigate the reciprocal relationship presumed to exist between children's underlying epistemic beliefs, their style of social interaction and the impact that this interaction might have on their beliefs about the source and accessibility of knowledge.

Pre-test tasks were scored according to the three part scoring protocol detailed in Appendix B. No significant differences in overall performance of any age group were

evident between phase one and phase two subjects. For purposes of analysis baseline scores were categorized according to a four part coding scheme. Subjects could therefore earn a score of between 0 and 3. Subjects who did not pass any of the pre-test items received a score of 0; subjects who passed one pre-test item earned a score of 1; those who passed two items, a score of 2; three items, a score of 3. (The highest score obtainable for 3 year olds was 2 as they were only pre-tested on two tasks). It was expected that this first dimension upon which subjects differed formed the foundation for children's interactive style and the degree of impact that such interaction might have on their developing competence.

Of the ten 3 year olds tested, seven subjects failed both tasks, T1 and T5. One subject failed T1, and 2 subjects passed both tasks. No 3 year olds were transitional. These results are consistent with the trend identified in phase one, i.e. a 75% failure rate overall. Two pairs functioned at the same level of baseline competence. These four subjects did not pass any pre-test tasks.

Four year olds displayed greater variability in performance. Two children were transitional on two items. When transitional scores were collapsed with fails however, the distribution of pass/fail was approximately equal. Overall there was a 44% failure rate, a similar pattern to that obtained in phase one. One 4 year old pair, identical twin girls, were at the same level of baseline competence.

Three 5 year olds were considered transitional on two pre-test tasks. Consistent with phase one data, 5 year olds tended to do better across all items, attaining an overall passing rate of nearly 69%. Three pairs were matched for baseline competence, passing all three pre-test tasks.

Subject scores are displayed in Table 8. This table also indicates which pairs of subjects were functioning at the same level of epistemic competence and those pairs who held disparate beliefs about the source of knowledge. As can be seen in Table 8, six pairs

of subjects were matched for epistemic competence based on their pre-test scores.

Audio tapes of the interactions of paired subjects were transcribed verbatim by the experimenter. A subset of these transcribed interactions was examined and coding schemes were developed to describe the different patterns of responding. One coding scheme was constructed in order to capture the degree and style of interaction between members of each pair. Another was more directly related to individual subject's beliefs about the source and accessibility of knowledge. These two dimensions, although considered to be distinct and separate, appeared to interact reciprocally, mutually affecting the overall pattern of responding of the paired subjects.

What follows is a discussion of these dimensions in terms of the characteristic marker points or discrete division points which were found to be ordered in hierarchical fashion.

The first dimension, as noted above, involves the pattern of social interaction between pairs of subjects. This dimension consisted of four distinct styles.

Level 0: Non-Interactive: The first style can best be described as "no interaction". Very young subjects, when requested to discuss together the stimuli before them, tended to do so independently, although often simultaneously or looked to the experimenter for direction. Indeed, a great deal of experimenter input was necessary to get any form of discussion going at all. Such children appeared to be not only unaware of what the other person's perspective was, but also unaware that the other was expressing a perspective at all. They were totally unconcerned, not only with their partner's beliefs, but with their actual presence.

This style of verbal communication is analagous to what Piaget termed "collective monologues". Piaget noted that very young children, playing side by side, would carry on "conversations" with the other child, without any apparent interest in or awareness of the other's response, should there be any. Such conversations are best described as

Table 8

Number of Pairs Matched for Epistemic Competence Based on Number of Items Passed:

Pre-test, Phase Two

Score: Partner A				
Score: Partner B	0	1	2	3
0	2	0	0	3
1	1	0	1	2
2	4	0	1	0
3	0	1	1	3

running monologues of the action taking place during play (Flavell, 1985). Consistent with this communication style, any verbal interaction that did occur at this level originated from the experimenter to subjects. These communications invariably took the form of questions or probes. Furthermore, probes to subjects were generally followed by "I don't know" type of responses or implicit expressions of agreement with anything that the experimenter said. This pattern of interaction earned a score of 0.

Level 1: Own View, No Compromise: This level of interactive style was characterized by subjects "agreeing to disagree" with each other. Such children appeared to be aware of the other's differing viewpoint but were not overly concerned that it differed from their own. These children, although still requiring a fair amount of experimenter direction to keep them on task, did interact well with one another but tended to hold strongly to their own beliefs given their respective restricted or privileged information base. Subjects did not insist that their partner was wrong and they were right; did not insist that the other go along with their viewpoint. However, they reiterated their own belief continuously and consistently. For instance, in one such pair discussing a Doodle, T4, the fully informed subject continuously stated "It's a witch. That is all it can be." The uninformed child of this pair changed his mind a number of times about the possible identities, but finally held to his belief that it could only be a triangle. The fully informed subject often requested that we "fill in" the uninformed child and reveal the whole stimuli to them. This pattern of interaction earned a score of 1.

Level 2: Incorporative: Subjects operating at the third level of interactive style tended to incorporate both their own and the other's knowledge into their response, hence "incorporative". These children interacted more with the other member of the pair than with the experimenter and were fully aware of the other's point of view. This was evident in the modifications they made when stating their beliefs about the identity or

meanings that could be attached to the task materials. A verbatim example best illustrates this style.

T5, Fire puzzle described on page 55.

Uninformed child (UN), "This wolf is trying to catch the bunny and the bunny is running away back to his den and the wolf is running after it to catch it and eat it for lunch."

Fully informed child (IN), "Right."

Experimenter (E), "Is that all that is happening?"

IN, "No, there is a fire and so that's why they are running away."

UN, "But there is a fire so that one (points to wolf) is trying to get away and while he is trying to get away he is chasing the bunny to have it for lunch!"

IN, "Yeah, and his tail is burnt and while he is running away from the fire he is chasing after the bunny to its den but he might not get in at the back door but he wants to have the bunny for lunch!"

These subjects responded to the task at hand as if it were a game. Once they grasped the rules of the game and understood that anything and everything was allowable, they played it quite competently. This style of interacting earned a score of 2.

Level 3: Mutuality: The fourth level of interactive style, although similar to the above, was distinctly different in terms of the degree of modification that children made to their own verbalized response. This qualification is considered important for it was difficult to determine the extent to which they modified their actual belief or knowledge. However, based on the modifications made to their verbal responses during interaction, such children's social graces appeared to be developed to the extent that not only did they verbally acknowledge the other's opinion, but modified their own opinion in the interests of social harmony. In colloquial terms, they "agreed to agree" with the other, attaining a

level of mutuality that was acceptable to both. Unlike Level 2, there was no attempt at incorporation. Rather, one or both subjects dismissed their own initial statements in favour of their partner's response. Of particular interest is the fact that some children, although functioning at a higher baseline level of epistemic competence than their partner, appeared to regress during the interaction and downgraded their stated belief about the naive observer's knowledge. These pairs of subjects also performed as if the whole procedure was a game, only for them the rules were slightly different, corresponding to more sophisticated socially accepted norms. This style of interacting earned a score of 3.

The second dimension has as its foundation children's beliefs about the source and accessibility of knowledge. This dimension closely parallels the constructivistic theory of knowledge (Chandler & Boyes, 1982) described earlier in this thesis. The coding scheme developed for it corresponds to the three part scoring protocol detailed in Appendix B. Subjects were scored according to their responses to naive observer questions, the final task of phase two involving the puppet as naive observer. These statements, made during the course of social interaction, were taken to reflect their beliefs about the source of knowledge.

Those children who believed that knowledge resided in the objects themselves received a score of 1. These children characteristically responded that the puppet had full knowledge, equivalent to their own privileged information, in spite of his restricted perceptual access. (See Appendix B for verbatim examples). Subjects who made statements which attributed partial knowledge to the puppet, were considered transitional and earned a score of two. Children whose statements reflected their understanding that knowledge resided within, and was constructed by, themselves and others, by not crediting the puppet with any of their own privileged information, were given a score of 3.

This study was in no way intended as a training study. With this in mind it is important to make two things very clear. First, scores achieved during this final task are considered to reflect any differences there might be between children's social-cognitive performance in a peer-peer context and their performance in a child-authority context or child-experimenter context. This is not to presume that children take away from this interaction any permanent structural modification in epistemic competence. Second, the present study was designed to investigate: a) what kinds of beliefs children bring to a social interactive process; b) what occurs during the interaction; and, c) what sort of epistemic statements children make within the context of social interaction. Therefore, the following results are presented with a focus on any changes in beliefs about the source and accessibility of knowledge as reflected by scores achieved during social interaction.

A random sample of 9 transcripts were scored blind by a second judge. The percentage of inter-rater agreement was 94 %. Results of the application of the above noted coding schemes are detailed in Table 9. In the interest of clarity and for the purpose of discussion, pairs of subjects have been grouped according pre-test scores, resulting in two main categories. In the first category, pairs of subjects were equal in terms of current epistemic competence at pre-test; six pairs of "matched" subjects. The second category consisted of subjects who did not have equal pre-test scores, hence "mismatched". This category was further divided into two types of pairs. One type in which one member had a score of 0 at pre-test and was therefore considered to be copy-theoretic. The other member was either transitional, achieving a score of 1 or 2, or quasi-constructivistic, receiving a score of 3; eight pairs in all (mismatched "A"). The second type of pair consisted of subjects who were not matched, but both members were either transitional, score of 1 or 2, or quasi-constructivistic, score of 3 at pre-test; five pairs in all (mismatched "B"). Results will be presented categorically.

Table 9

Pairs of Subjects Categorized According to Pre-test Scores, Style of Interaction and Beliefs about Source and Accessibility of Knowledge and Meaning During Interaction.
Phase Two

Matched Pairs	Age months	Pre-test	Interaction	Knowledge Source
1	43	0	0	1
	41	0	0	1
2	38	0	0	1
	42	0	0	1
3	56	2	2	2
	56	2	2	2
4	60	3	2	3
	69	3	2	3
5	61	3	2	3
	63	3	2	3
6	67	3	3	3
	67	3	3	3

Note:

Pre-test: 0 = no tasks passed; 1 = 1 task passed;
 2 = 2 tasks passed; 3 = 3 tasks passed.

Interaction: 0 = non-interactive; 1 = own view, no compromise;
 2 = incorporative; 3 = mutuality.

Knowledge Source: 1 = fail; 2 = transitional; 3 = pass.

Table 9, continued

	Age months	Pre-test	Interaction	Knowledge Source
Mismatched Pairs: A				
1	36	0	0	2
	41	1	0	1
2	36	0	1	1
	45	2	1	3
3	44	0	0	3
	44	2	0	1
4	65	0	2	2
	68	2	1	1
5	61	0	2	2
	66	2	3	3
6	59	0	1	2
	59	3	1	1
7	48	0	0	3
	53	3	1	1
8	67	0	0	3
	68	3	1	1
Mismatched Pairs: B				
1	53	1	1	2
	53	2	1	2
2	60	2	3	3
	64	3	3	3
3	62	1	2	3
	60	3	2	3
4	55	2	2	2
	59	3	2	2
5	51	1	1	2
	53	3	1	2

Matched Pairs: Overall there were six pairs of subjects matched for competence at pre-test. In two of these pairs all members were copy-theoretic at outset. They were characterized by a non-interactive style and responses to naive observer questions indicated no change in epistemic level. During social interaction they responded consistently, giving no evidence of any differences with respect to their beliefs about the source of knowledge. The third pair remained solidly transitional throughout. They passed two tasks at pre-test. During interaction they incorporated their partner's beliefs with their own and remained transitional in terms of their stated beliefs about the source of knowledge. The last three pairs were all quasi-constructivistic at pre-test. These pairs interacted well, either incorporating the other's beliefs or coming to some mutual agreement. None of these pairs gave evidence of change from a quasi-constructivistic mode of understanding.

Most noticeable within this pattern of results is the fact that social interaction appeared to have little or no impact upon the kinds of epistemic statements made by children who were matched for epistemic competence. They did not undergo any change in their beliefs about the source of knowledge as a result of the process. Furthermore, the degree and style of social interaction appeared to be related to children's functional level. As can be seen from Table 9, interactive styles for these pairs were matched between individuals and were appropriate for their level of competence.

Mismatched Pairs: The eight pairs of mismatched subjects, one of whom was copy-theoretic at pre-test, (mismatched "A"), are characterized by a much more complex pattern of results. First, the style of interaction was not consistent between individual members of pairs, nor were the styles of interaction directly predictable from their pre-test scores. Second, in contrast to the matched pairs, as evidenced by their responses to naive observer questions, the majority of these subjects were characterized by some changes in the kinds of epistemic statements they made during

social interaction. As is evident in Table 9, six out of eight subjects who made copy-theoretic statements at pre-test were considered to be transitional or quasi-constructivistic in response to naive observer questions during the interaction.

Conversely, of those children who were transitional or quasi-constructivistic at pre-test, only one remained at the same level. Two subjects who passed two items at pre-test made quasi-constructivistic statements during the final phase of the interaction. Five of eight subjects actually appeared to regress and made copy-theoretic statements in response to naive observer questions during social interaction. Of particular interest is the fact that all five subjects who regressed during interaction had partners who functioned at a higher level of epistemic competence at the close of interaction. In only one pair did both partners attain a higher level of competence.

Such a pattern seems to indicate that those pairs in which one member was functionally copy-theoretic at pre-test attempted to reach some common level of understanding. In six out of eight pairs, higher functioning subjects modified their verbal responses to accommodate their partner's less sophisticated beliefs about the source of knowledge and meaning.

The second type of mismatched pairs, (mismatched "B"), consisted of subjects all of whom were either transitional or quasi-constructivistic at pre-test. The pattern of results evident within this group of subjects is less conclusive than is that of the other two categories. This may reflect the fact that it is difficult to pin down precisely what it means to be transitional. Transitional subjects, by definition, grasp only some aspect of the concepts necessary to succeed at these types of tasks. Subjects functioning within a transitional mode tend to fluctuate with respect to epistemic competence. It is quite probable that some form of progression is evident within the transitional period. However, children may not advance through this progression in any consistent manner. It is therefore extremely difficult to establish specific parameters which would

delineate a transitional mode of understanding of knowledge and meaning.

As shown in Table 9, transitional and quasi-constructivistic subjects, although mismatched at pre-test, were characterized by consistent interactive styles between members of pairs and these styles were appropriate to their level of epistemic competence. Four subjects who were transitional at pre-test remained transitional during social interaction. Two transitional subjects responded in a quasi-constructivistic manner to naive observer questions at the close of interaction. Two quasi-constructivistic subjects remained quasi-constructivistic. The remaining two were considered to be transitional during the final phase of social interaction.

All four members of pairs whose interaction style was characterized by "agreeing to disagree" with one another, remained transitional. It seems reasonable to suggest that this is an enduring feature of transitional subjects' mode of interacting. Of the remaining three pairs, in which subjects either incorporated both partner's beliefs or reached some level of mutuality during interaction, one or both members attained a higher level of epistemic competence at the close of phase two.

Discussion

Phase One. The phase one study was designed to investigate whether the individual tasks, historically developed to be used for assessment of young children's developing epistemologies, as evidenced by their perspective taking abilities, could be ordered along a hierarchical continuum describing their order of acquisition. Inherent in this investigation was the desire to see if this order of acquisition reflected the historical appearance of each task in the perspective taking literature. Consistent with the hypotheses, it was found that the task stimuli were ordered along a decalage corresponding to children's improving inferential abilities and perspective taking skills, given their functional epistemic level. This decalage describes a progression away from a copy-theoretic mode of knowing towards a more constructivistic theory of

mind and increased epistemic competence. The age-related trends within and across tasks found in past research (Gnepp & Gould, 1985; Gopnik & Astington, 1988; Taylor, 1988) were evident in this study. The minimal difference in the number of subjects failing each item supports the expectation that this continuum describes quantitative, not qualitative change. That is, ability to succeed at the tasks administered in the present study required at least a transitional or quasi-constructivistic level of epistemic understanding.

Based on past research, the tasks selected for use in this project were chosen because success (passing) requires at least a transitional mode of knowing. Therefore, those children operating from a copy-theoretic view of the world were not expected to succeed at any of these tasks. The results showed that those children operating from a copy-theoretic mode, the majority of whom were 3 year olds, failed all the tasks. Four year olds made up the greatest portion of transitional subjects. The quasi-constructivistic group consisted primarily of 5 year olds. These results provide further support for the proposal that all the tasks selected lie above the point of qualitative change and that the continuum describes quantitative increases in perspective taking ability. As predicted, young children below the point of qualitative change in epistemic understanding failed at most tasks. In addition, children who gave evidence of functioning within a transitional or quasi-constructivistic mode of knowing, that is, above the point of qualitative change, passed some or even all of the tasks. Their scores described an ordered continuum corresponding to the expected task hierarchy.

The expected hierarchical ordering of tasks (T1, T2, T3, T4, T5, T6), based upon the conceptual analysis described earlier in this thesis was not found. The order of tasks in terms of their pass/fail rates was T1, T3, T2, T5, T4, T6. However, this is not considered problematic as the differences in these pass/fail rates were minimal, providing further support for the conclusion that all tasks measured the same

underlying construct. The most significant change in young children's social-cognitive development still appears to be the empirically documented qualitative shift. Based on the results of phase one, the gradual increases in functional epistemology, occurring beyond this point, are small by comparison.

Three tasks administered in this study are worthy of further discussion in light of their inherent social-cognitive demands. Such demands quite probably had a direct impact on the pattern of pass/fail scores across age groups.

Task 4, Doodles, were found by most subjects to be more difficult than previous tasks and were responsible for the second greatest number of failures overall. Furthermore, the number of children in all age groups who scored transitionally on this task increased dramatically relative to other tasks. On this task subjects tended to speculate more spontaneously with respect to the possible meanings or potential realities for these stimuli than for previous ones. When compared to other tasks it appeared that the increased ambiguity of these pictures, in terms of the multiple possible meanings that could be given to them, is likely responsible for this difference. For instance, the sponge rock, T2, has only two possible meanings. Either it is a rock or it is a sponge. The puzzle sequences, T5, have one meaning, a clear socially defined story, that once revealed, becomes the only truth. These puzzles have a logical reality based meaning.

Doodles, on the other hand, have no such clearly defined social meaning. Nor do these cartoon drawings themselves have a firm anchor in young children's real world. Witches on roller skates and drowning witches being rescued by boats are more "unreal" occurrences; more open to the fanciful imagination of young children. They are therefore open to more possible realities or meanings. This means that, in spite of their own complete and privileged information, their knowledge about the "truth", children in this study felt free to ascribe to the restricted view any number of probable or

improbable identities and stories.

In a related vein, T3, the Smarties box filled with dice, or the crayon box filled with peanuts was also open to more possible meanings than T1 or T2, as indicated by the pattern of results for 4 and 5 year olds. (Although judging from the initial reaction of most children to the Smarties box, this stimuli could be only one thing. Wow! Smarties!!). This task however, has a closer relation to real objects existing in young children's world, limiting their degree of spontaneous speculation about possible identities. Once fully informed about the true contents, children seemed aware that there were only two options. The Smarties box could contain either Smarties or dice; the crayon box, only crayons or peanuts; all four, very concrete objects.

T6, the story sequence, was found to have the greatest number of failures. Furthermore, no five year olds were transitional on this task. It is most likely that this was due to the increased information processing and memory demands inherent in these stories. Like the puzzles, the stories had a firm grounding in a socially logical meaning, which once understood, became the truth and only reality. These stories were however, longer and more complex in contrast to the simpler puzzle stories. A great number of details had to be kept in mind in order to simply understand the story, prior to making inferences about the naive observer's knowledge. These attributes quite probably made them more difficult for all but quasi-constructivistic children, who either had the cognitive capability or they did not.

Based on the normative data gathered in phase one of this study, it seems reasonable to suggest that changes in young children's social-cognitive development that occur after the qualitative shift proposed by Piaget and documented throughout the perspective taking literature, are relatively small and influenced by individual differences. Quite clearly, these results demand replication if they are to achieve any enduring validity.

Phase Two. The second phase of the present study was intended as a first attempt to re-socialize the task environment in order to determine the reciprocal interaction between children's underlying epistemic beliefs, (i.e. what they bring to a social interaction), the degree and style of such interaction and the impact that this interaction might have on their beliefs about the source and accessibility of knowledge or meaning. Tasks administered in prior perspective taking studies which have been empirically documented to accurately assess young children's individual competence were chosen for use in this phase. Utilization of such proven tasks was mandatory in order to discover any differences in children's functional level, as indicated by their performance, that might be evident when these tasks were administered within the context of peer-peer interaction as opposed to the traditional child-experimenter environment.

With reference to the degree and style of interaction and children's underlying epistemic beliefs, the results of this study indicated that under certain circumstances, ("matched"), children's level of epistemic competence was related to the pattern of social interaction in which they engaged. Copy-theoretic children, when paired together, were characterized by a non-interactive style. Transitional subjects, paired together, agreed to disagree or tended to undertake the incorporation of their partner's point of view with their own. Quasi-constructivistic children, as partners, agreed to agree.

In sharp contrast to the matched pairs, the data gathered in phase two showed that, when paired with a partner functioning at a more advanced level of epistemic competence or with a partner functioning from a less sophisticated level, subjects' interactive styles were not consistent within pairs, nor were they directly predictable from pre-test scores. Children apparently adjusted their style of verbal interaction to "fit" with that of their partner. This finding is consistent with past research (Shatz & Gelman, 1973; Sachs & Devin, 1976; Dunn & Kendrick, 1982) which revealed that

children between the ages of 3 to 5 years have a good sense of the conversational capabilities, or incapacities of others and make appropriate adjustments in their verbal interactions. Dunn and Kendrick (1982) referred to these verbal modifications as "talking up" or "talking down" strategies.

Although it has been argued that children merely imitate the speech patterns utilized by adults when addressing other children, or that they make adjustments reflecting some fixed stereotype they have about listeners (Lee, 1989), it is proposed here that young children are not only aware of other's conversational abilities, but gain, during the course of social interaction, an understanding of the epistemic capabilities of others as evidenced by their speech, and make appropriate adjustments. Within this view, it appears highly probable that young children are not only genuinely capable of taking the perspective of another, but that they adjust the actual construction of meaning, which is reflected through their verbal communication, as it occurs within a given social context with a specific other. Should this be so, then young children's level of epistemic competence is not merely related to, but no doubt underlies and provides a foundation for the style of social interaction of which they are capable. It is proposed here that these two factors interact mutually and reciprocally.

With respect to the impact that social interaction may have on children's underlying epistemic competence, Lee (1989) proposed a positive relationship between the number of social components that are built into any given task and the ability of children to construct an accurate appreciation of the perspective of another. He suggested that what appears to be egocentricity in young children, is a function of certain types of tasks, those that are devoid of social content. A logical extension of such an argument is that perspective taking, like any social activity is not an individual construction but is a joint construction or a co-construction, which is facilitated by the presence of another. As discussed earlier in the introduction of this thesis, Piaget

suggested that it is through peer interaction that children gain the concept of perspective and become increasingly accurate at inferring the thoughts, emotions and wishes of others (Leslie, 1983). A proposal put forth by Vygotsky (1978) holds that whatever children do in interaction with a more competent other will be superior to what they can do on their own (Wertsch, 1985).

What all these proposals have in common is the notion that children find meaning and knowledge in social interaction in concert with, and corresponding to, their own individual cognitive developmental level of understanding. The difference between these points of view is a temporal one, but also has to do with the origins of new knowledge. Piaget seems to be proposing that social experience, once digested, leads to individual change. The change comes from within the individual child, after the experience. Vyotsky's proposal is that new knowledge or meaning arises first in social interaction. Social-cognitive change is understood to emerge during the course of interaction interpersonally. The results of the present study support a Vygotskian viewpoint only because young children's performance during peer-peer interaction indicated that they were capable of a more sophisticated understanding of their social-cognitive world, of which, based on their pre-test scores, they should not have been capable.

In the present study, with the exception of pairs of subjects considered to be matched for epistemic competence at pre-test, social interaction constituted a disequilibrating experience which had some impact on their functional epistemic level. Results showed that, based upon the statements made during social interaction and upon responses to naive observer questions, transitional and quasi-constructivistic children appeared to alter their epistemic beliefs during the course of phase two. It was predicted that those children maintaining a copy-theoretic view of the world would not give evidence of any change in functional epistemology during interaction. The data revealed however, two separate groups of subjects characterized by two distinct types of

modification of their stated beliefs. The modifications made were related to subject's underlying epistemic level at pre-test and to their partner's level of epistemic competence.

The first group could be referred to as "undershooters". These were the subjects who, although functioning at a higher level of epistemic understanding than their partners, modified their stated beliefs about the source and accessibility of knowledge and meaning to better fit with their partner's level of understanding. It was clear from the audio transcriptions that neither partner was merely parroting the other, but that over the course of the social interaction more sophisticated subjects became increasingly aware of their partner's limitations in terms of understanding and thus modified their own stated responses. It is in no way suggested that these undershooters took away from this type of interaction a less sophisticated understanding about the source and accessibility of knowledge, nor is it suggested that they continued to function from a lower level of epistemic competence. However, it was clear that social interaction had an impact on these young subjects which could not be predicted by their pre-test scores.

The second group consisted of subjects who improved their level of epistemic competence, hence "overshooters". These subjects benefitted from the disequilibrating experience of exposure to another's more advanced perspective taking ability. They gained an advantage through exposure to their partner's grasp of the various possible sources of knowledge and meaning, and made statements during interaction that reflected this achievement. Such a pattern is consistent with theoretical proposals regarding the importance of social interaction. This group however, included subjects who were considered to be copy-theoretic based on pre-test scores. Although inconsistent with our own hypothesis that children below the point of qualitative change would not benefit from social interaction, these results have some intriguing implications.

First, in view of the results of phase one of this study, in which the majority of 3 year olds failed all tasks, indicating that children of this age are functionally copy-theoretic, it seems unlikely that these subjects were misdiagnosed at pre-test. Therefore, it may be that, consistent with Vygotskian theory, children are capable of enhanced performance during social interaction, over and above that of which they are capable on their own (Wertsch, 1985). Second, consistent with Lee's (1989) theoretical stance, it would appear that the presence of another and the enriched context provided by a more truly social milieu, has a significant impact upon children's developing social-cognitive skills. Third, from a Piagetian viewpoint, the peer interaction undertaken in this study may have created an impetus for improved perspective taking skill and provided a foundation for progression to a more advanced level of epistemic competence. It is plausible that our overshooters may have been on the verge of some social-cognitive change, functioning within a "critical or sensitive period" (Aslin, 1981) or within a "zone of proximal development" (Wertsch, 1985). For the majority of children in this study, social interaction was a truly cooperative co-construction of meaning and knowledge.

In any research project designed to investigate young children's theories of mind there is an interactive process between experimenter and subject. Such a phenomenon is of course common to all research and attempts are generally made to eliminate experimenter demands. The impact of such social influence has traditionally been controlled for, or alternatively, ignored. However, given the relative status of experimenter and subject in developmental research, it seems likely that it is in this context that the influence might be greatest. This social component no doubt played a part in the present study. To as great an extent as possible this research project attempted to control for experimenter influence through adherence to verbal scripts, which were followed as precisely as possible and by actively shifting the focus from

child-experimenter transaction to peer-peer interaction.

It is proposed here that the very fact of the existence of such a social component and the impact it might have should not be ignored. Rather it should be acknowledged and its effects taken into account when designing studies and interpreting results. If this type of natural interaction is inherent in children's everyday lives, and, if as suggested above, social interaction is central to social-cognitive development and the developmental progression of young children's developing theories of mind, then it can not be ignored in experimental research.

With this in mind therefore, it would appear that the next logical step in any attempt at re-socialization of the task environment would be to re-structure the tasks themselves to take this and other "social" factors into account. Immersion of traditional perspective taking tasks into a more natural social environment is only one possible route to accomplish this. Ingenuity and creativity are hallmarks in the field of developmental research and such characteristics will no doubt prevail in any future attempts to re-socialize the task environment methodologically. It will be through such methodological modification and analyses of results that theoretical re-structuring will occur.

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Appendix A

In the typical unexpected change procedure, subjects listen to a relatively lengthy narrative involving a central character who witnesses the placement of some desirable object (i.e. a piece of chocolate) in a particular location. Upon some pretext or other the central character is caused to be absent from the room during which time a second story character moves the object to a different location. Subjects, in possession of complete information regarding the actual location of the object, are asked whether, upon his/her return the central character, who is in possession of partial information only: a) knows where the object is; or, b) where he/she is likely to look for it.

Children younger than 4 years of age have consistently been found to assert that the story character not only knows the new location of the object but will also look for it there. The uncontested rationale for use of this type of story is that unless or until children show evidence of appreciating that one's beliefs about the world may be false, that is, by responding that the story character does not know where the object is and that he/she will most likely look in the location in which it was originally placed, they cannot possibly be said to have any notion of what having a belief means, and cannot therefore be said to possess a theory of mind (Chandler & Fritz, 1989).

Appendix B Scoring Protocols

Across all tasks, young subjects who appeared confused by the whole procedure or said they didn't know what the puppet thought, were given a score of 1. Probes were often used to clarify the exact level of epistemic belief. These took the form of "How does he know that?" "Why do you think Mr. Puppet thinks that?"

Task 1) Object Property: Subjects received a score of 1 in this task if they responded that the puppet knew what colour the stimulus really was even though he had access to restricted information only. For instance, a yellow witch's head covered with a blue transparency. Subject responds that puppet knows it is really yellow. A score of 1 was also given if subjects made phenomenistic or intellectual realism type errors. A score of 2 was given if subjects responded that the puppet thinks the witch is green but knows it is really yellow. This was the most prevalent response given by transitional/quasi-constructivistic children. Subjects were given a score of 3 if they responded that the puppet didn't know that the witch was really yellow, but thought it was a green witch.

Task 2) Object Identity: A score of 1 was given if subjects responded that the puppet knew that the rock was really soft or if he knew it was a sponge or "a thing to wash with", or if they were not clear about the appearance-reality distinction. A score of 2 was given if they said the puppet thought it was a rock but knew that it was really a sponge or was soft, again a prevalent transitional response. A score of 3 was given if they said the puppet thought it was a rock.

Task 3) Smarties/Crayons: Score of 1 given if subject said the puppet knew there were dice in the smarties box or peanuts in the crayon box. Score of 2 if responded that the puppet thought it was smarties/crayons but knew it was dice/peanuts. Score of 3 if subjects responded the puppet thought there were smarties/crayons in the box.

Task 4) Doodles: Subjects failed this task if they said that the puppet knew what was under the covered portion of the picture. For instance, subjects who responded that the puppet knew it was really a picture of a ship and a drowning witch received a score of 1. Subjects who incorporated their own full knowledge with the puppets restricted information and concocted a plausible, yet different story for what was really occurring in the doodle were given a score of 2. For instance, subjects who said that the puppet thought it might be two witch's hats but one was floating in the water, thus giving partial knowledge, were considered transitional in this task. Once again, a common response was "He thinks its two triangles (whatever they themselves had first thought) but he knows that it is really a witch and a ship. Subjects who quite creatively attributed to the puppet some alternative, albeit unrelated thoughts, (i.e. he thinks it might be two dinosaur tails but maybe he thinks its two clown hats) were also given a score of two. Subjects who gave no knowledge to the puppet passed this task, score of 3.

Task 5) Puzzle: Subjects who responded that the puppet knew what was depicted in the missing puzzle piece (and thus knew why the animals were running, away from the fire) were given a score of 1. A score of 2 was given to subjects who gave some but not all of their own knowledge to the puppet. As in task 4, some transitional children were quite creative in this regard and interwove lengthy stories which incorporated full with partial knowledge, complete with their own embellishments. For instance, one subject responded that the puppet thought that the wolf was running away from the fire; that you could tell that because his tail was burnt and because he was afraid, but that he was also chasing the rabbit and feeling happy about eating the rabbit up for dinner - all at the same time (and all in one breath!) Those subjects who responded that the puppet knew only about what he could see in the two puzzle pieces were given a score of 3.

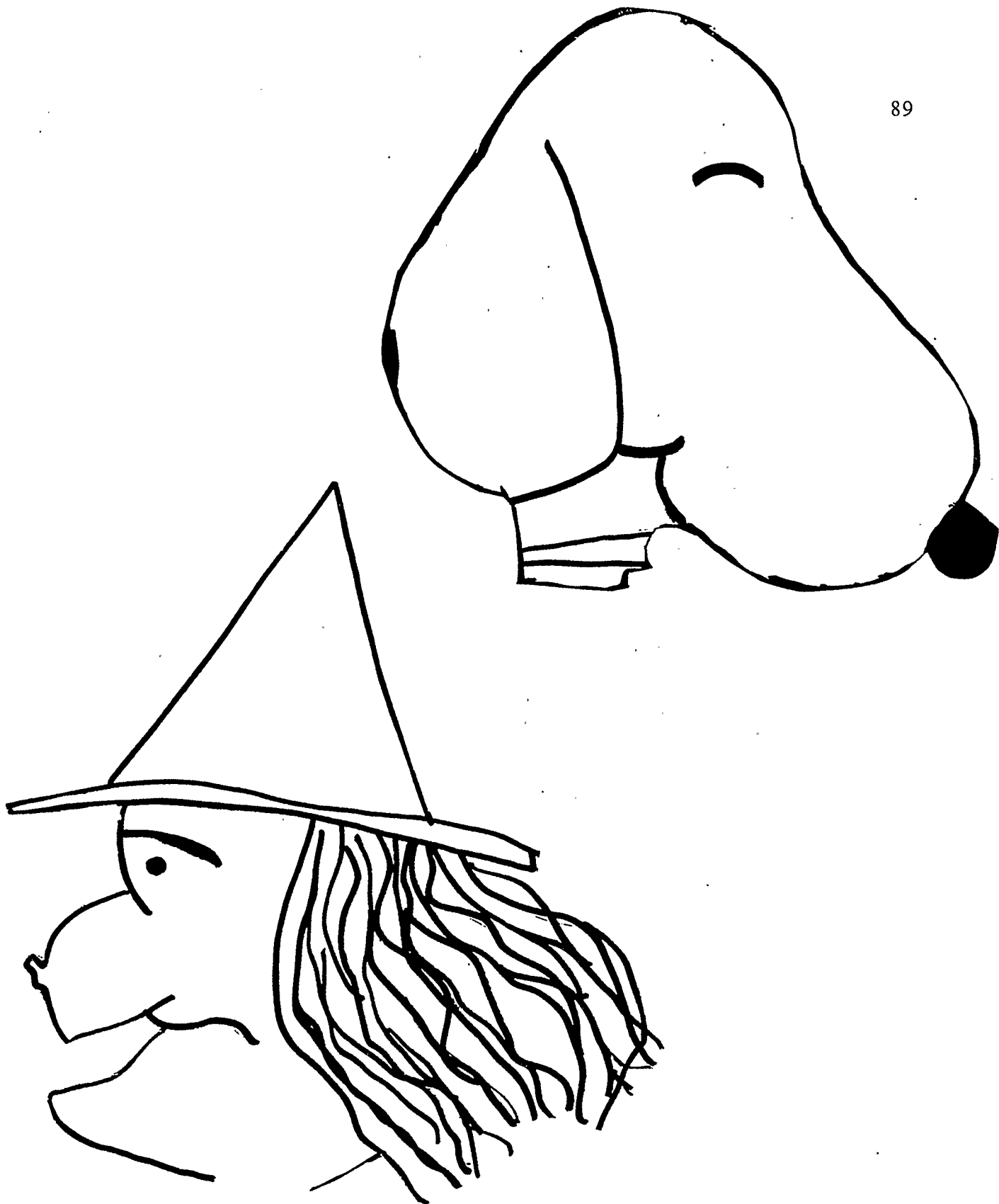
Task 6) Story sequence: Subjects who responded that the naive observer within the story sequence and the puppet knew why the story character was feeling unhappy (or

frightened/happy depending on the story) failed this task. Some subjects responded that the naive observer within the story sequence did not know why the main character felt the way s/he did, yet maintained that the puppet did have this knowledge, also failed the task and were given a score of 1. (This scoring decision was considered appropriate because the naive observer within the story was depicted as appearing puzzled, often with a big question mark above his/her head making it obvious that they did not have knowledge). If subjects clarified that the naive observer within the story had full knowledge because the main character had informed them of the details, scores were based on the knowledge given to the puppet.

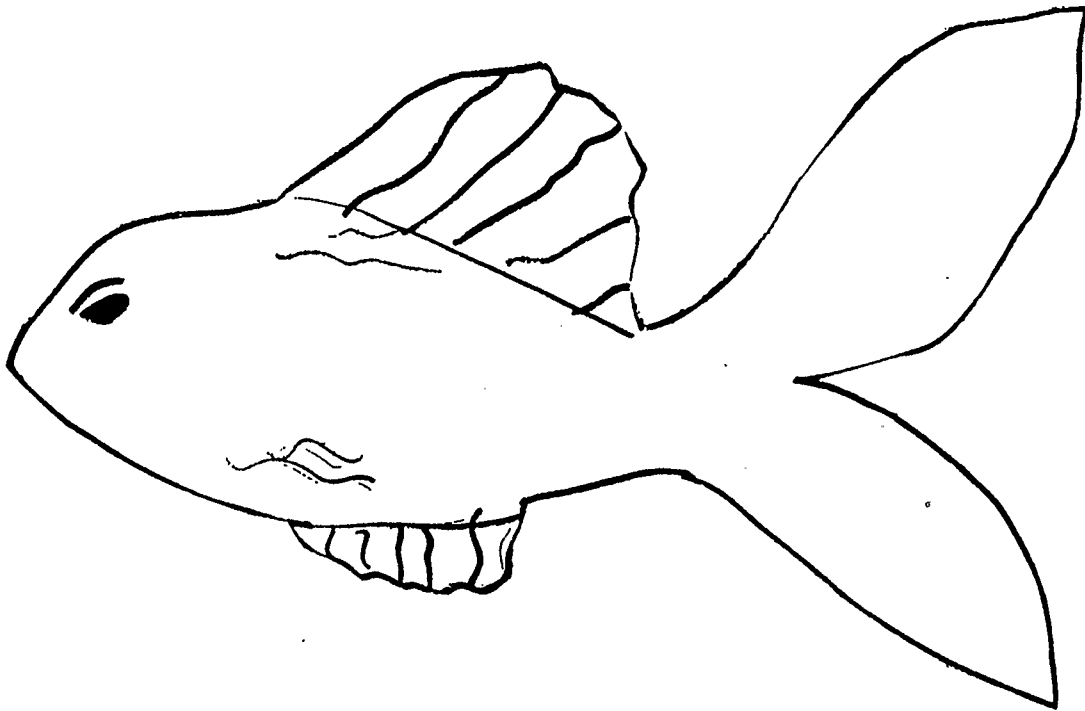
As in the puzzle sequences, transitional subjects were quite creative and often concocted stories which incorporated their own full knowledge with the puppets limited information. They also spontaneously developed unlikely but plausible reasons why the puppet had this knowledge. This earned a score of 2. Subjects who said the puppet had no knowledge of why the main character was in their present emotional state were given a score of 3.

Appendix C

Sample Task Materials



Task One: Transparencies

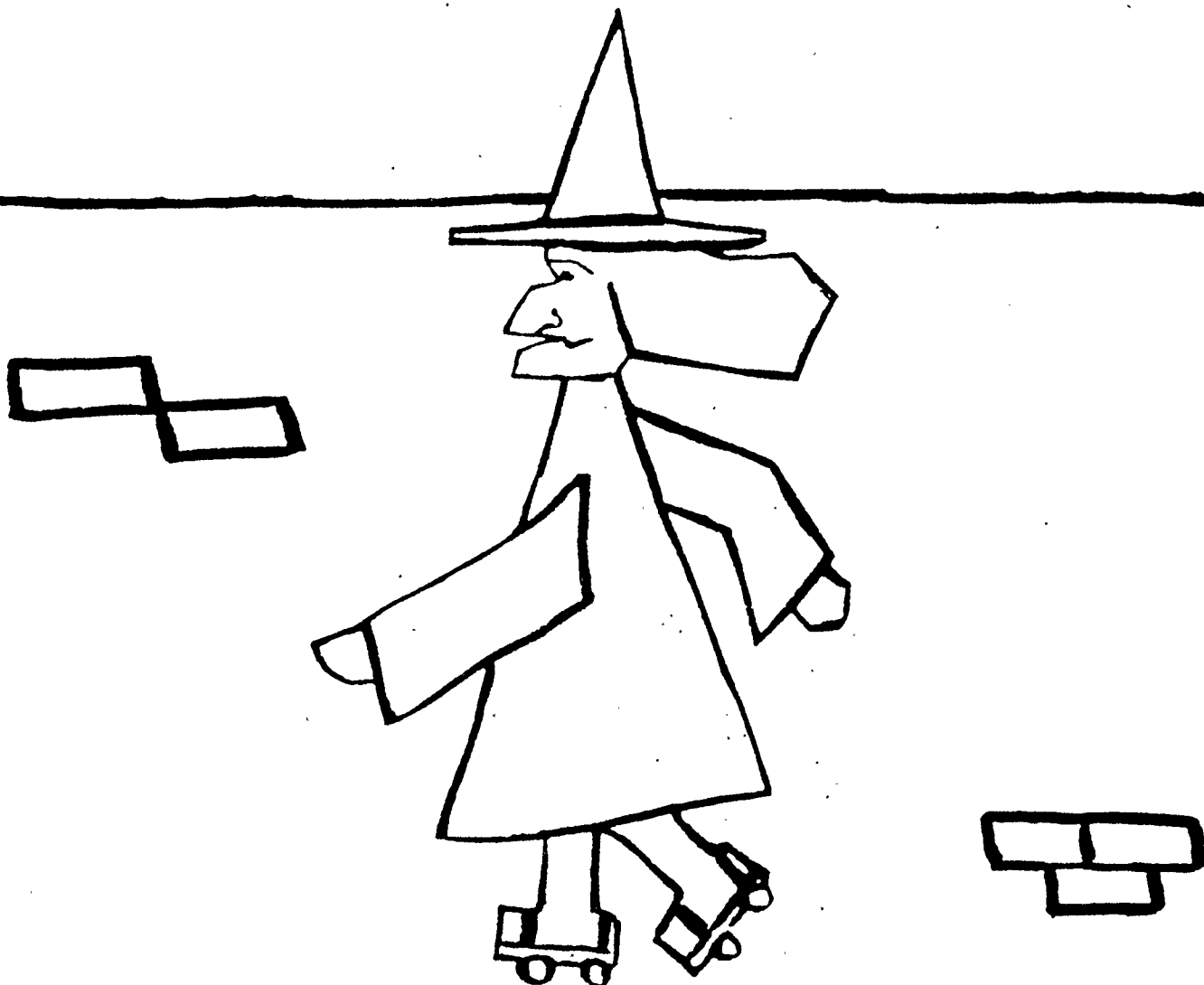


Task One: Transparencies



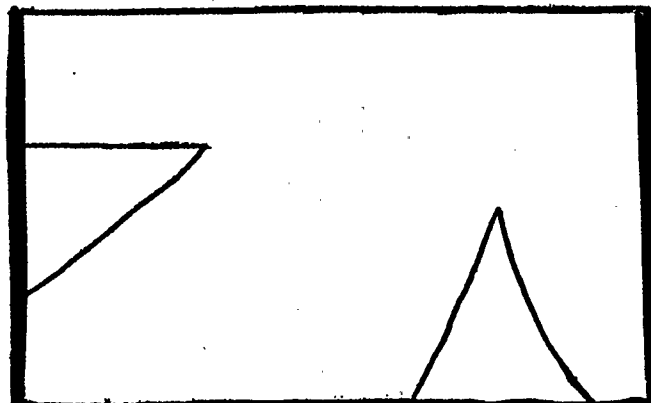
Task Four: Doodle

Restricted Information View



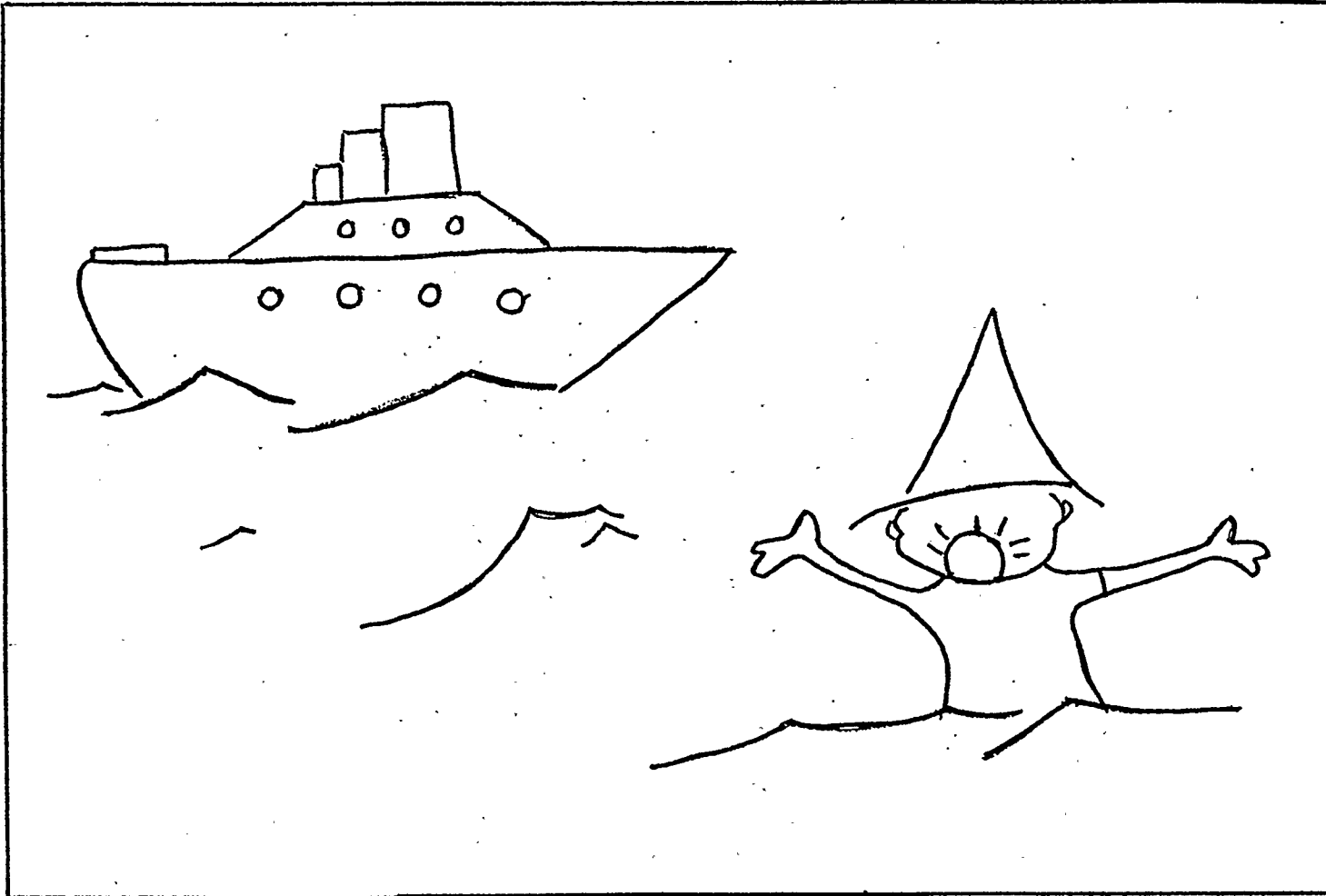
Task Four: Doodle

Privileged Information View



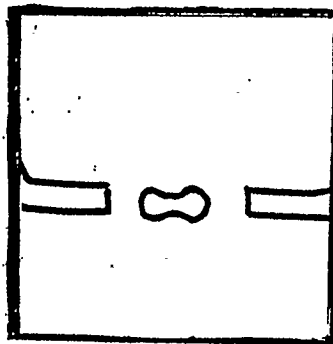
Task Four: Doodle

Restricted Information View



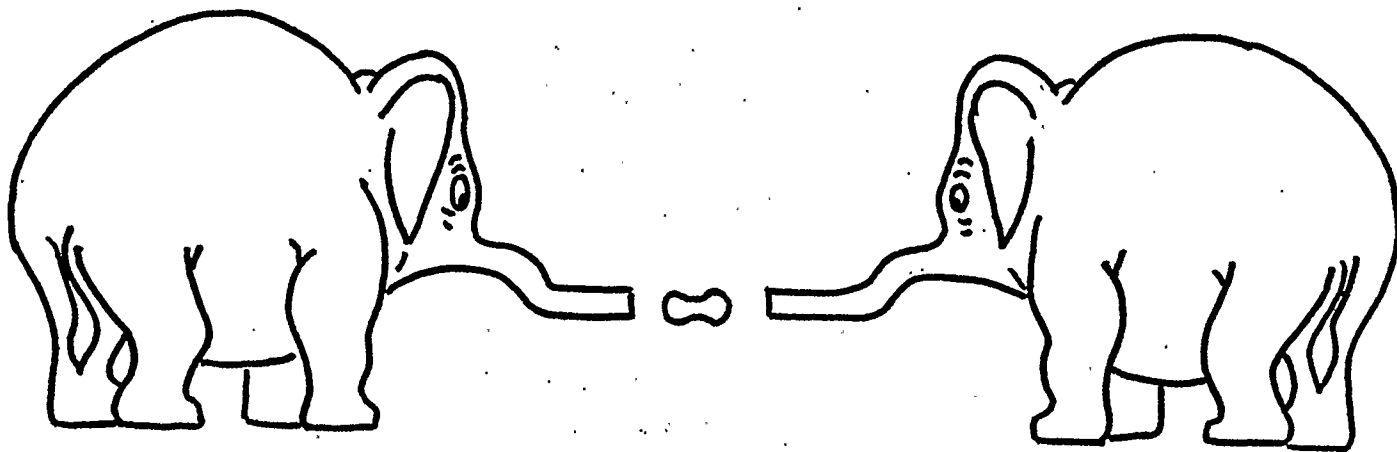
Task Four: Droodle

Privileged Information View



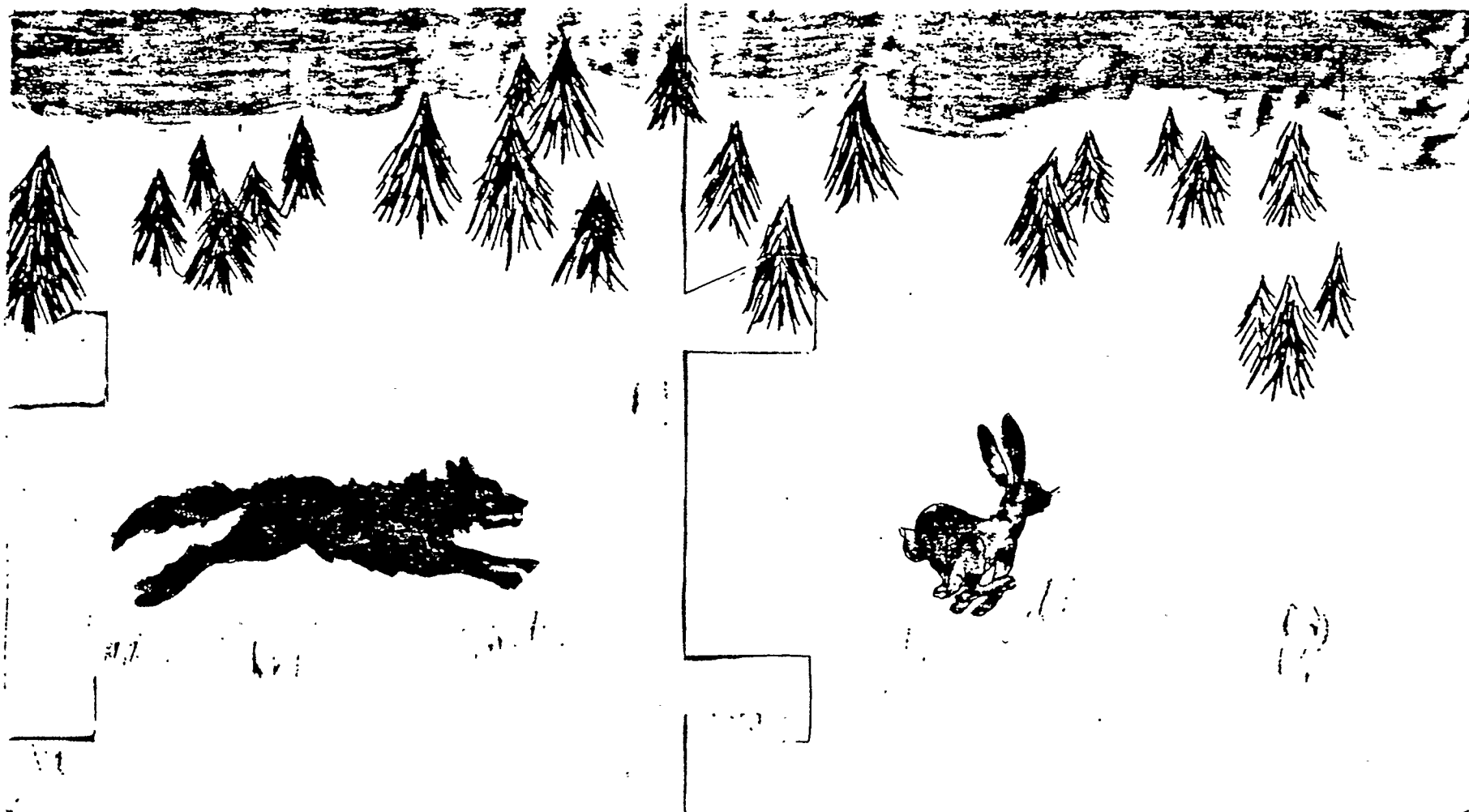
Task Four: Doodle

Restricted Information View



Task Four: Doodle

Privileged Information View



Task Five: Puzzle

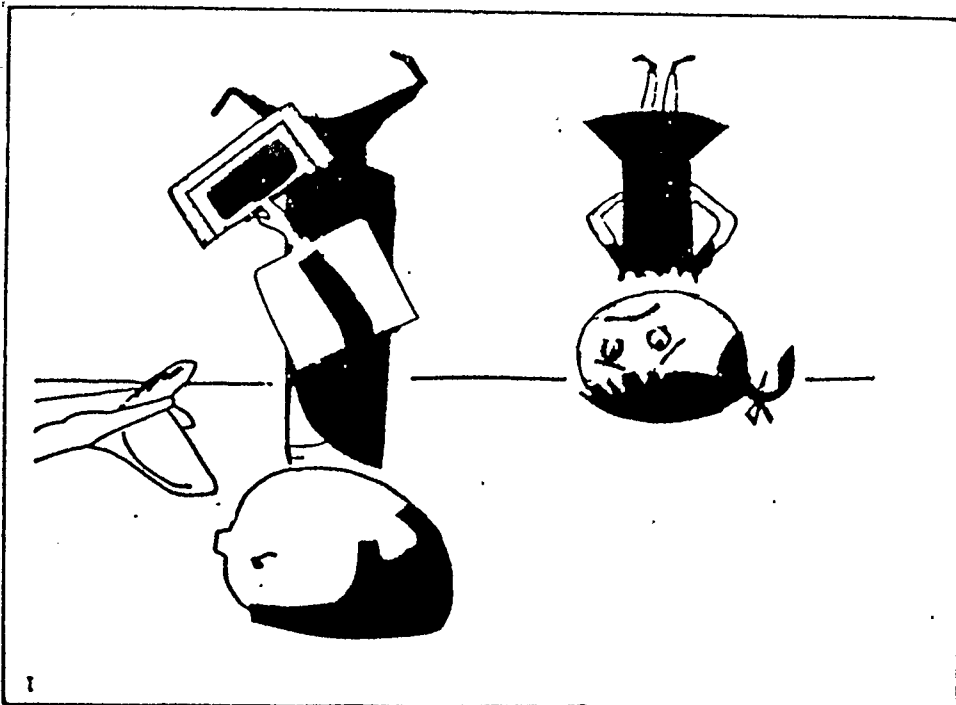
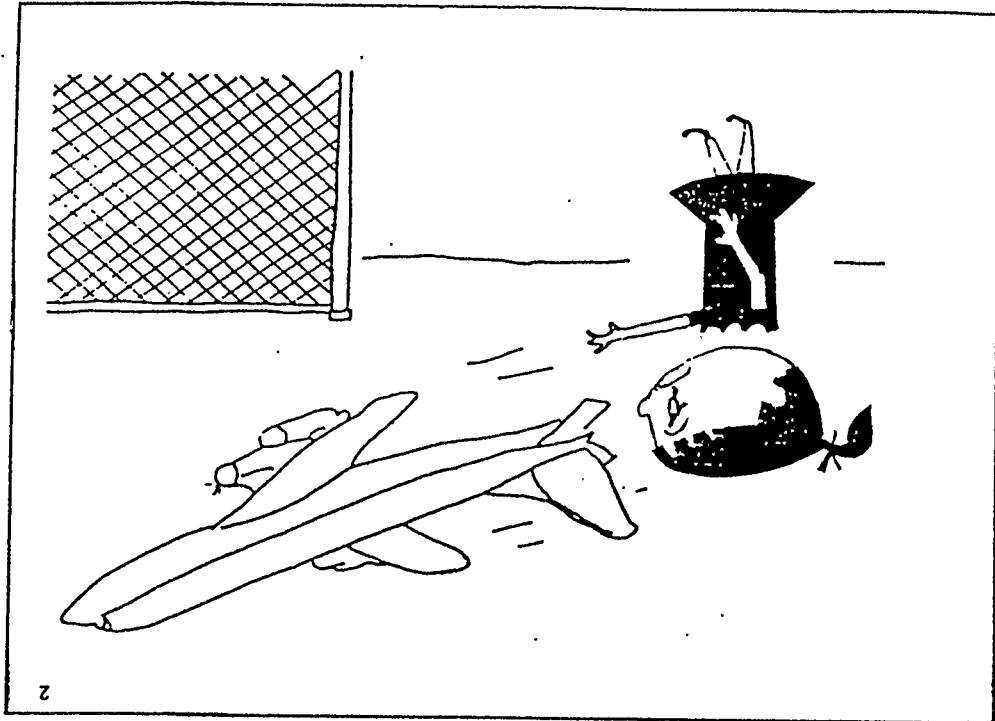
Restricted Information View

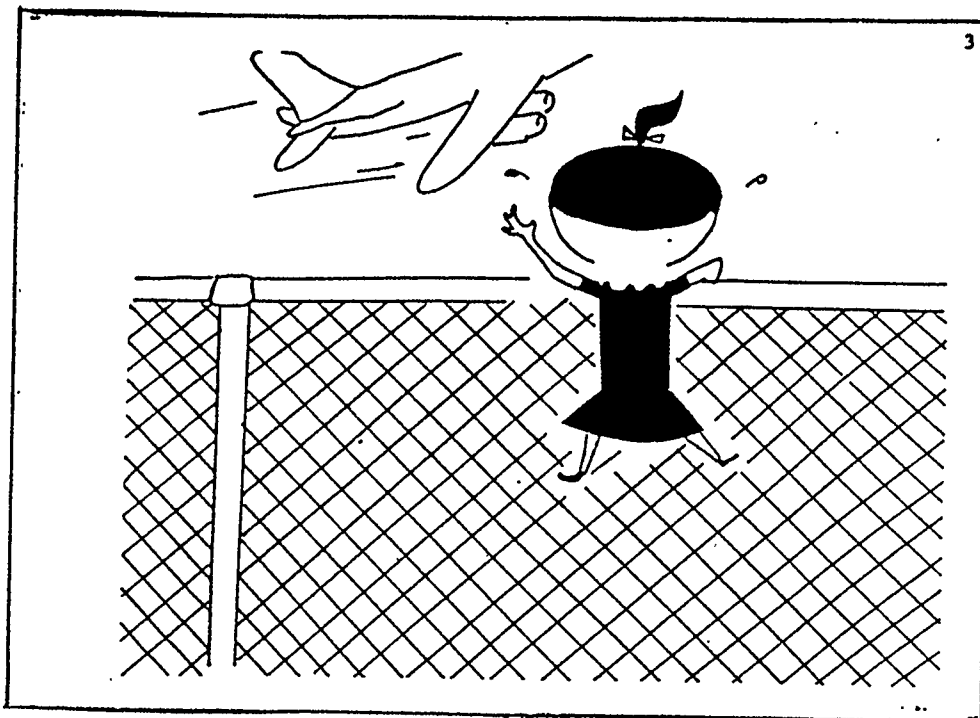


Task Five: Puzzle

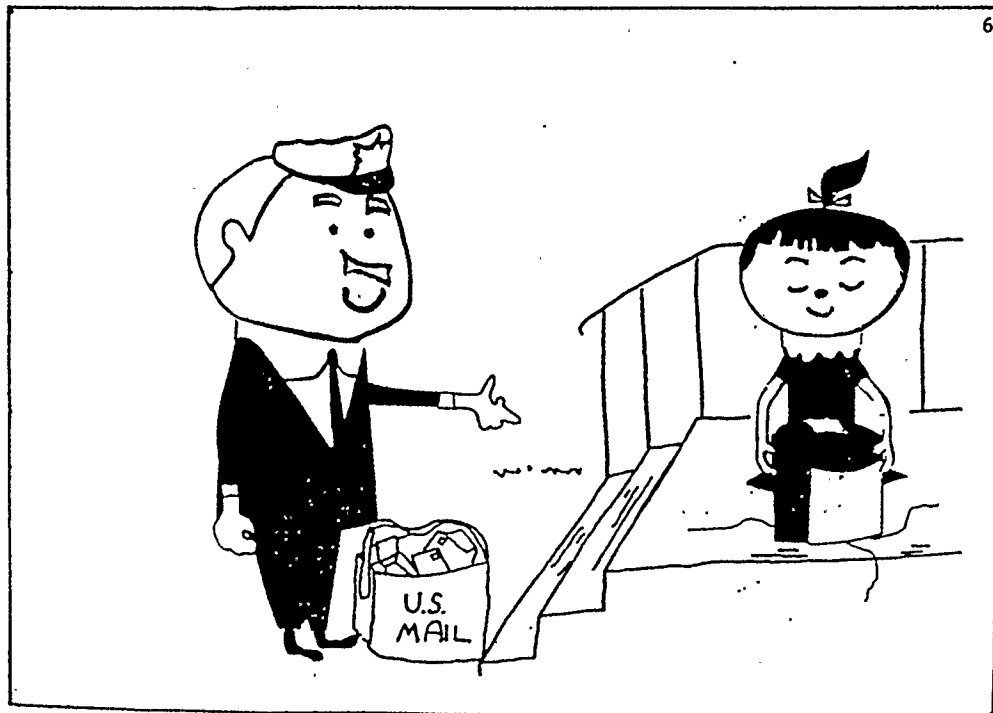
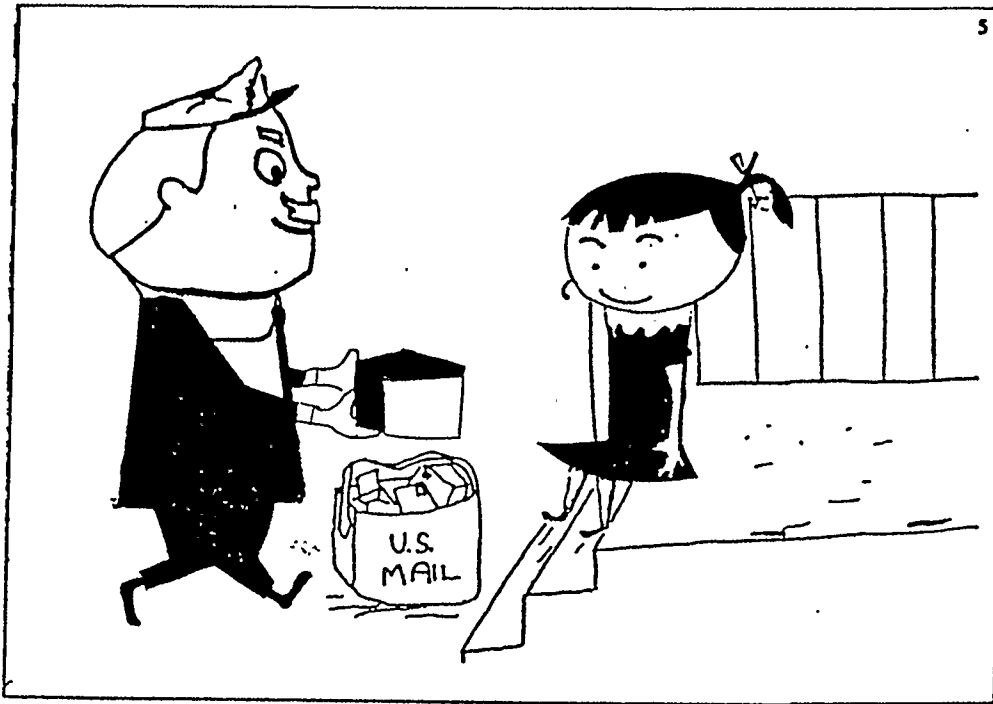
Privileged Information View

Task Six: Story Sequence

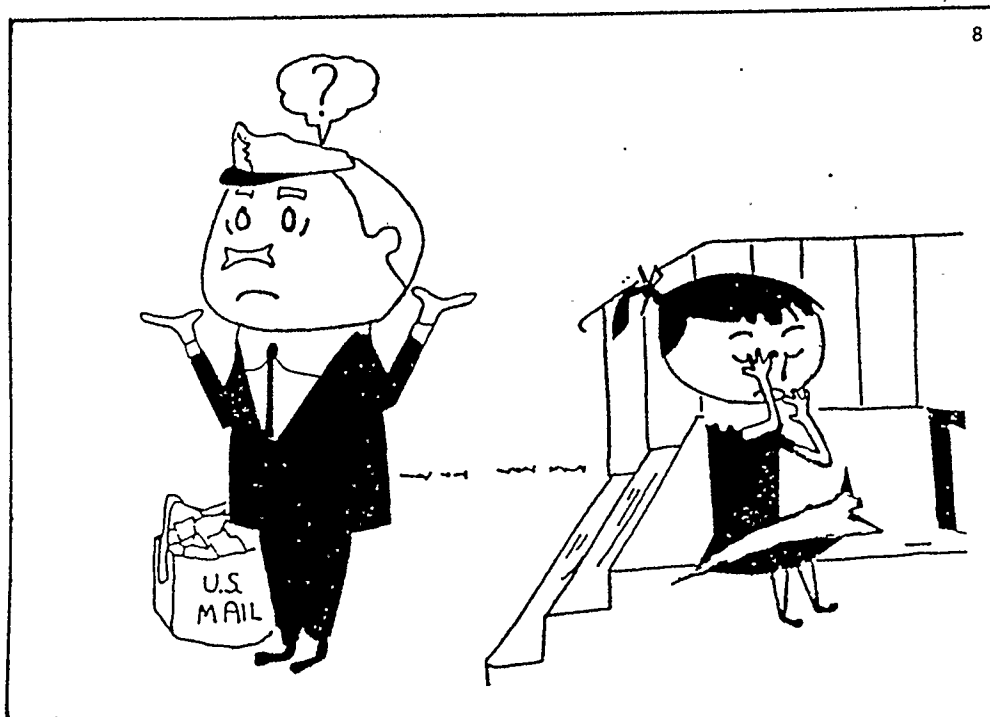




Task Six: Story Sequence



Task Six: Story Sequence



Task Six: Story Sequence