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THE EFFECT OF A PEER MODEL'S EXPLORATION AND EXPRESSED

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by

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

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Abstract

THE EFFECT OF A PEER MODEL'S EXPLORATION AND EXPRESSED AFFECT ON THE CURIOSITY OF SECOND-GRADE CHILDREN

by

CHERYL FUSS KLEEFELD

Advisor: Professor Barry J. Zimmerman

The present study was an attempt to experimentally examine the effects of a peer model's exploration and expressed affect on the curiosity of second-grade observers. The effect of these modeling variables were studied on two distinct classes of dependent measures: (1) on a child's verbally expressed curiosity about a given problematic situation, and (2) on a child's subsequent exploratory behaviors and strategies. Also examined were the relationship between teachers' perceptions of children's general level of curiosity and the youngsters' performance on an actual experimental task. The relationship between the children's verbally expressed curiosity and their actual observed exploratory behaviors was also studied.

Public school children participated in four experimental conditions and one control condition in which various levels of exploratory behavior and affective response to a malfunctioning toy were modeled by a second-grade girl. The children's responses to a similar problem were subsequently observed. The subjects were coded for both quantity and type of exploratory behavior. A questionnaire was administered to the subjects immediately following the experimental session, in

order to assess the children's understanding and curiosity about the incident. In addition, teachers were asked to rate their children's general curiosity and exploration.

Results of the study revealed that the children imitated the model's exploratory behaviors. Affect of the model appeared to have no effect on subjects' behaviors in the experimental setting or scores on the post-experimental questionnaire. Implications of the results were discussed in relation to the theoretical framework set forth in the first sections of this paper.

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This dissertation is dedicated to my favorite and most influential models, my parents, Abraham B. Fuss and Evelyn H. Fuss, and to my husband, Ken, who was always there when I needed him, and who is very curious about when and if our lives will ever return to normal, with all my love, and a question or two which may remain forever unanswered.

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CHAPTER I

INTRODUCTION

Perhaps one of the most important and elusive problems in the field of educational psychology is the identification of those variables which enhance motivation for learning. A distinction has been drawn between intrinsic and extrinsic motivation. Intrinsic motivation has been defined as a "cognitive theory of motivation in which the idea of behavior for its own sake and as its own reward is essential" (Haywood & Burke, 1977). There has been a tendency to view intrinsic and extrinsic motivation as two opposing, irreconcilable metatheoretical positions. Some researchers have attempted to study curiosity as one aspect of so-called intrinsic motivation (Fowler, 1965; Berlyne, 1971; Nunnally & Lemond, 1973; Deci, 1975; Vidler, 1977; Haywood & Burke, 1977). These approaches have attempted to explain people's curiosity and exploratory behaviors in terms of internal psychological variables. They define curiosity as a state of cognitive arousal, brought about by an internal drive or conflict. This theoretical position has shown relatively little interest in the external social factors which might influence actual exploratory behaviors. While external motivation theorists have not shown much interest in curiosity as a construct, an interactionist theory such as social learning theory would appear to offer an alternative theoretical viewpoint which can accommodate external social variables as well as cognitive phenomena (Rosenthal & Zimmerman, 1978).

According to social learning theory, there is a "continuous reciprocal interaction between behavioral, cognitive, and environmental influences" (Bandura, 1978). The self system is an important aspect of this interaction. In social learning theory, the self is no longer a passive agent, buffeted about by internal drives and physical environmental stimuli (Bandura, 1977b). Rather, the self is an active agent, with "cognitive structures that provide reference mechanisms and...a set of subfunctions for the perception, evaluation, and regulation of behavior" (Bandura, 1978). The person, then, chooses his or her own course of action based upon perceptions of consequences in the social and physical environment (Bandura, 1978). In social learning theory, an individual's actions are regulated by three basic causal processes: stimulus control, internal symbolic control, and outcome control (Bandura, 1969). Stimulus control refers to the regulation of an organism's behavior by "antecedent stimulus events that convey information about probable consequences of certain actions in given situations" (Bandura, 1969, p. 19). In order to survive and effectively function, an organism must develop appropriate anticipatory reactions to environmental cues. Symbolic control refers to cognitive and verbal mediators, "in the form of self-instruction, implicit categorizing responses, or linkages through common word associates" (Bandura, 1969, p. 40). Internal symbolic control is an essential element of social learning theory, especially when considering the higher-level thought processes of the human subject. Outcome control refers to reinforcing response-feedback processes. This tripartate conception of stimulus control, internal symbolic control, and outcome control has been considered essential to the behavioral self-control literature (Thoresen & Mahoney, 1974).

The self-control literature provides a useful model in the sense that it provides for personal environmental planning through one's knowledge of controlling variables (e.g., Thoresen & Mahoney, 1974). A person's thoughts or feelings about physical and social settings is basic to understanding his or her behavior. In this sense, curiosity beliefs and exploratory behaviors can be conceived of as aspects of a common self-regulation process. Curiosity, then, can be thought of as a self-generated cognitive strategy which directs people's subsequent behavior.

Within the social learning paradigm, it is possible to consider the more sophisticated forms of exploratory behavior as a rule governed class of learned behaviors. These learned behaviors are assumed to be acquired in social settings. Some examples of social settings in which curiosity might be modeled are in the home by parents and siblings, in the school by teachers and classmates, and in spontaneous playgroups of peers and friends. Curiosity responses might include object exploration, pretend games, and question-asking. Through observation and imitation, these behaviors and strategies become incorporated into the individual's own behavioral repertoire. Once acquired, these skills not only improve children's success during problem solving but also improve the youngster's sense of self efficacy (Bandura, 1978).

This self efficacy conception of curiosity and exploratory behaviors has been recognized by Glanzer (1958) and Nunnally and Lemond

(1973). However, subsequent research on curiosity and exploratory behavior, for the most part, has not dealt with this self efficacy and self control aspect of functioning. Bandura stated: "In social learning theory, people play an active role in creating information-gathering experiences as well as in processing and transforming informative stimuli that happen to impinge upon them" (Bandura, 1978, p. 356). The role of the subject as an active participant in the exploratory process has not received adequate coverage in the literature to date.

Another aspect of curiosity and exploratory behavior that has been neglected is the study of individual differences in curiosity response to specific problem settings (Haywood & Burke, 1977; Vidler, 1977). Social learning theorists doubt the usefulness of trait constructs in general in predicting performance across settings. Trait theorists acknowledge construct validity problems, but feel that trait constructs are useful when used in conjunction with situational or state information. The present study will examine this issue.

CHAPTER II

REVIEW OF THE LITERATURE

An Examination of the Concepts of Curiosity and Exploratory Behavior

Definitions of Curiosity. According to the dictionary, curiosity is defined as "the desire to learn or to know about anything, inquisitiveness" (Barnhart, 1959). Within the psychological literature on curiosity, there are many different definitions. In order to obtain a satisfactory operational definition of curiosity and related exploratory behaviors, a distinction must be made between curiosity and related psychological constructs such as problem solving and problem finding. Berlyne defines curiosity as "a drive which is reduced by the reception and subsequent rehearsal of knowledge" (Berlyne, 1954, p. 18). According to Berlyne, there are several varieties of curiosity, and its active counterpart, exploration. Curiosity can be "diversive" or "specific" (Berlyne, 1970). Diversive exploration is "aimed at stimulation, regardless of source, that possesses characteristics such as novelty, surprisingness, and complexity to the right degree" (Berlyne, 1970, p. 967). It includes activities regarded as play and is related to autistic or free-associative thinking. Diversive exploration is suggested to be produced by a state of boredom from which the organism seeks relief through stimulation (Berlyne, 1960, 1963, 1970). In this sense, it is similar to the "sensation seeking" of laboratory animals observed by Butler (1953).

Specific exploration, on the other hand, occurs "when the organism is disturbed by a specific lack of information (uncertainty) and...is directed towards portions of the external environment that may supply the information through which the uncertainty-based discomfort (perceptual curiosity) can be relieved" (Berlyne, 1970, p. 967). Both specific and diversive curiosity are considered by Berlyne to be internal drive states. Specific exploration is similar to diversive exploration in that it is usually evoked by novel, surprising, complex, or ambiguous stimuli (Berlyne, 1970, p. 967). The difference between the two is that diversive exploration seeks to relieve a state of boredom, while specific exploration seeks to relieve uncertainty or resolve conceptual conflict through acquisition of knowledge. Kagan (1972) states succinctly: "The motive to resolve uncertainty might be renamed the motive for cognitive harmony, consonance, equilibrium or simply, the motive to know, which Berlyne calls epistemic curiosity" (Kagan, 1972, p. 57).

According to Berlyne, there are two types of specific curiosity, perceptual and epistemic. Perceptual curiosity is that kind of exploration studied in lower animals and neonates. It is a drive that is reduced by exposure to appropriate stimuli. Epistemic curiosity, in contrast, involves the quest for knowledge (Berlyne, 1960). It is a response to conceptual conflict and involves thinking and problem solving behaviors. Conceptual conflict implies "conflict between mutually discrepant symbolic response-tendencies--thoughts, beliefs, attitudes, and assumptions" (Berlyne, 1966, p. 178). Conceptual conflict is believed to be reduced by the acquisition of knowledge (Berlyne, 1960).

Piaget's concept of equilibration is also based upon conceptual conflict. The concept of equilibration involves a process of self-regulation, defined as "a series of active compensations on the part of the subject in response to external disturbances and an adjustment that is both retroactive (loop systems or feedbacks) and anticipatory, constituting a permanent system of compensations" (Piaget & Inhelder, 1969, p. 157). Equilibration is considered to be an internal mechanism which regulates the disparities between existing schemata and new and/or conflicting information impinging on the organism from the environment. According to Piaget, equilibration is one of the major factors in cognitive development. Hunt (1960) argued that Piaget's notion of equilibration assumes that the acquisition of knowledge and the subsequent development of schemata include some component of intrinsic motivation.

Previous researchers have not always drawn a clear distinction between problem solving and epistemic curiosity. Making such a distinction is not an easy task. The problem solving literature has not been consistent in the use of operational definitions (Davis, 1973; Forehand, 1966). The one feature, however, that has distinguished problem solving studies has been the reliance on experimenter-given instructions to the subject that both pose the problem and specify the nature of the solution. This aspect of research in problem solving greatly reduces the researchers' opportunity to observe individual differences in motivation during problem solving. Unfortunately, in epistemic curiosity research, many studies include methodologies that also pose the problem to the subject and then state the requirements of the solution. Clearly, when a subject is instructed concerning what the problem is, and what he is expected to do during the experimental session, it is questionnable whether the observed results reflect much about a person's knowledge needs but rather reflect responsiveness to experimenter needs. Once a subject is told to do something, the results become less predictive of information gathering in settings outside the laboratory. The construct of curiosity is concerned with motivation in naturalistic situations. It is therefore necessary to minimize experimenter specifications during research on curiosity and to keep the problem settings as natural as possible.

"Presented Problems" versus "Discovered Problems"

A relatively new area of research offers some resolution to the experimenter intrusion problem. Getzels (1964) distinguished between "presented problems" and "discovered problems." Presented problems refer to problems that are not presented but appear to occur "naturally." The notion of "discovered problems" has not been addressed in Piagetian theory (Arlin, 1979). Until recently, the notion of discovered problems has also not been addressed in creativity research (Csikzsentmihalyi & Getzels, 1970). To my knowledge, this issue has not been raised in research on curiosity. This motivation to detect problems appears to be close to what Berlyne has called epistemic curiosity. It is an issue which needs to be explored further.

Arlin's Cognitive Model of Problem Finding

Arlin (1975) provided a cognitive model of problem finding which distinguished between curiosity as an internal response and subsequent behavior. Her position was based on the research of Getzels (1964) and Csikzsentmihalyi & Getzels (1970) that explored problem finding as part of the creative process. Arlin suggested the need to consider the detection of problems as a separate aspect of problem solving in natural contexts. This awareness of naturally occurring problems appears to be essentially what Berlyne called epistemic curiosity. If one considers epistemic curiosity to be a cognitive representation of a problem situation, then problem finding behaviors can be regarded as operational definitions of the process triggered by this internal state. In contrast, problem solving consists of a sequence of behaviors which might occur once a problem has been accepted as a goal worthy of solution. In traditional problem solving studies, acceptance of this goal is assumed to be due to an experimenter's instructions. Theories of curiosity assume such goals are personally formulated. Thus, curiosity can be distinguished from problem solving if the "discovered problem" aspects are incorporated into its operational definition. Such an operational definition was used to guide the present study.

In Arlin's first study (1975), sixty college seniors were shown an array of 12 objects that had been previously used in problem solving research (Dunker, 1945, Maier, 1970). The subjects were directed by the experimenter to ask questions about the array. The questions were then analyzed according to the "intellectual products" categories of Guilford's (1956) structure of the intellect model. Arlin (1979) viewed problem finding behaviors to be self-motivated. However, her methodology did much to prompt problem finding behaviors, since the goal of the task was pointed out to the subject. The subjects were only free to vary the nature of their questions. This methodology greatly restricted observation of the subjects' "natural" inclination to solicit information in the real world.

Developmental Implications of Arlin's Theory. Arlin (1975, 1977, 1979) assumed that problem finding behaviors do not fully emerge until children achieve Piaget's stage of formal operations. She assumed that there are two aspects of formal operations, problem solving and problem finding. Her assumption was that individuals must first learn to solve problems before they can find and define problems. One unfortunate implication of this assumption is that children are believed to be incapable of very much problem finding behavior until relatively late in their cognitive development. Arlin's (1977) assumption was based on research with a task which revealed developmental trends in problem finding ability. Subjects in the experiment ranged in age from seven to eleven years. Each child was seated before a table containing 12 objects (e.g., a black wooden block, a pair of scissors, a small piece of paper with a hole in the center, a box top, etc.). The children were then required to make up questions about any object or group of objects. The questions were then analyzed according to the six categories of Guilford (1956). The categories were units, classes, relations, systems, transformations, and implications. The results revealed clear developmental trends, indicating that operational level and quality of questions were positively related. Arlin concluded that operational level "may be a necessary but not sufficient condition for problem finding" (Arlin, 1977).

Arlin's conclusions about developmental stage and problem finding appeared to be questionnable. If formal operational reasoning were prerequisite to problem finding, why would developmental changes be observed before the onset of formal operational thought (about age eleven)? In addition, it is clear that children acquire the interrogative grammatical form at a very young age, and thus its use by children implies an awareness of knowledge needs long before formal operations. In addition, the quality of questions asked may not be a valid criterion for problem finding ability.

Implications for Curiosity Research. To date, there has been relatively little research devoted to curiosity or problem finding as defined in the present study. As a construct, curiosity includes self-motivated dimensions of problem finding. This factor has not been given much attention in prior research. More emphasis should be on the spontaneous choice of problems and level of mental effort displayed by the subject in naturalistic settings. According to Berlyne, the attainment of knowledge is the logical culmination of epistemic curiosity. Therefore the operational definition should focus more on inquiry behaviors (i.e., problem finding and defining) than on the results of solution efforts (i.e., problem solving, responding to questionning, etc.). The proposed definition of curiosity will focus on self-motivated dimensions of problem solving such as problem finding and defining. Exploratory behaviors of children, as well as the questions they ask, will be considered to be an indication of their curiosity.

Theoretical Approaches to the Study of Curiosity

The various theoretical approaches to the study of curiosity closely parallel the historical streams of method and thought in most areas of psychology. According to Cronbach's (1957) analysis, there are two theoretical strains, experimental psychology, and correlational psychology. To these two seemingly opposed positions were added various interactionist and cognitive social learning approaches (Mischel, 1968, 1973, 1979; Bowers, 1973), which sought an understanding of cognitive processes by directing attention to the variability of the environment, the structure of the person, and the interactions between them.

The experimental method allows for the control of situational or state variables. The goal of the experimenter is to control behavior by the manipulation of stimuli. Individual differences have been regarded as an "annoyance," and have been attributed to "error variance" (Cronbach, 1957). An overreliance on the experimental method has led to an emphasis on behavior change through manipulation of stimuli, rather than on the internal processes and/or behavioral stability of the organism (Bowers, 1973).

The correlational method, on the other hand, emphasizes behavioral stability based on "trait" notions of personality (Bowers, 1973). The classical "trait" view suggests two main ideas: (1) an individual's behavior should be relatively stable across situations, and (2) individual differences between subjects should emerge within the same situation (Bowers, 1973). The use of personality, intelligence, and/or aptitude testing rather than systematic observation of the subject in an experimental setting is used to measure "the broad underlying dispositions which comprise human personality" (Allport, 1937). The question guiding a correlational psychologist is: "What present characteristics of the organism determine its mode and degree of adaptation?" (Cronbach, 1957, p. 674).

The trait theories of personality began to appear inadequate when observations of human behavior revealed variation within people across situations. A single, unchanging trait alone could not account for such variability in human behavior. State models were added to the trait model paradigm in an effort to enable trait models to explain situationally specific phenomena. Situational stimuli were viewed as evoking transitory states, which in turn elicited specific responses (Mischel, 1968). Cronbach (1957) envisioned the merging of the two disciplines (experimental and correlational) through a simultaneous examination of both experimental situations and trait measures, using multivariate and factor analysis techniques.

From a social learning perspective, there are serious limitations to trait-state notions of human behavior. This combined model still describes people from an internal perspective and thus the role of experience as a causal factor in human functioning is de-emphasized. In contrast, social learning theory posits an interactionist model of personality in which cognition and behavior are given equal emphasis in relation to the environment. The social learning position assumes reciprocity in causation between environmental, cognitive, and behavioral elements. According to social learning theory, much behavior is acquired through modeling (Bandura, 1971, p. 5). There are three basic effects of modeling influences: (1) observational learning effects, where the individual observer acquires new patterns of behavior, (2) inhibitory effects, and (3) disinhibitory effects. In this scheme, reinforcement has "response-strengthening tendencies," but is not considered a necessary condition for learning to occur (Bandura, 1971, 1977b). In his recent writings, Bandura (1978) has emphasized the role of cognitive processes in motivation.

He suggested that individuals choose the response they are going to enact on the basis of their expectations about the outcomes of these and other behaviors. Individuals striving for self efficacy were assumed to direct their actions based on cognitions of the effects their actions will have. Bandura spoke of a "continuous reciprocal interaction" between "cognitive, behavioral, and environmental determinants," where "symbolic, vicarious, and self-regulatory processes assume a prominent role" (Bandura, 1977b). Internal processes were regarded as "primary links in causal sequences ...mediating events" (Bandura & Walters, 1963). Cognition was seen as an organizing structure that not only determines our perception and knowledge of reality, but also helps us at least partially construct the reality that we see (Bowers, 1973; Mischel, 1973; Bandura, 1978). The following sections will explore the body of research in the areas of curiosity and exploratory behaviors from the viewpoint of the theoretical paradigm presented here.

Arousal Theory: Behaviorism and Drive Reduction. In their review of the literature, Nunnally and Lemond (1973) report that prior to 1950, the study of curiosity and exploratory behavior in human subjects was a neglected area of psychological research. The major theories of learning and motivation placed little emphasis on intrinsic aspects of motivation such as curiosity and exploratory behavior. The research on exploratory behavior that did exist prior to 1950 utilized, for the most part, laboratory animals (Glanzer, 1958). The early psychologists (James, 1890; McDougall, 1908) considered curiosity to be an instinct or an emotion, an inborn response to novel stimuli. Recently, Nunnally and Lemond (1973) argued that curiosity is a "human tropism for making meaningful any object or activity that contains strong information conflict or is novel for any other reason."

Similarly, Berlyne (1954, 1960, 1963) views curiosity as a drive, a motive, and a need, brought about by a heightened state of arousal in response to collative stimuli (i.e., stimuli which are novel, surprising, incongruous, or complex). According to Berlyne, "Arousal is...heightened by initial contact with a pattern, and the extent of...rise in arousal appears to increase with the kinds of characteristics" of the stimuli (Berlyne, 1963, p. 287). In arousal theory, informational and/or perceptual conflict is the primary motivational mechanism, and a reduction in conflict is held to be reinforcing (Berlyne, 1960). According to Berlyne, "Epistemic behavior would seem to follow the discomfort-relief or drive and drive-reduction pattern...There are, it seems, conditions in which exploratory responses result from inborn reflexes and others in which they are evoked through classical conditioning" (Berlyne, 1960, p. 323). Instrumental conditioning can also play a part in the development of epistemic behavior, when interesting stimuli patterns are rewarding without being preceeded by cognitive discomfort. Either pleasant feelings or the absence of discomfort following the reduction of conceptual conflict underlies the development of epistemic curiosity (Berlyne, 1960). Berlyne's model is basically behavioristic because he utilized the experimental approach in which he manipulated stimuli and systematically observed subjects' reactions. Within this tradition, many types of stimuli were used, including, for example, preferences for shapes, letters, words, measurement of visual fixations, and subjects' choice of attention to stimuli through drawings exposed in a tachistoscope (Berlyne, 1958, 1963; Berlyne & Lawrence, 1964; Smock & Holt, 1962; Pielstick & Woodruff, 1964; Munsinger & Kessen, 1964).

According to Berlyne, a person's prior experience will determine the amount of cognitive conflict he can successfully process in any given situation. Prior experience includes exposure to and successful encoding of collative stimuli with the resulting development and expansion of cognitive structures. In this sense, Berlyne acknowledged some type of person-environment interaction, in which the organism's existing structures influence his readiness to respond to environmental stimuli (Berlyne, 1965).

It is clearly evident in all of Berlyne's writings that curiosity is defined as an internal state brought about as a response to a specific stimulus or stimuli, and that this state can best be examined within an experimental setting. However, in a book that he was working on at the time of his death, Berlyne foresaw a unitary factor emerging from a future multivariate analysis of a variety of measures obtained in a variety of situations (Berlyne, 1978). In this sense, Berlyne was moving toward either a reconciliation or an interrelation of the experimental (state) and correlational (trait) approaches to the study of curiosity.

The Correlational Approach: Trait Theory. While researchers in the Berlyne tradition were systematically varying stimuli and observing behaviors within the laboratory setting, another group of researchers, spearheaded by the work of Maw and Maw (e.g., 1964, 1968) applied correlational techniques to the identification and examination of the construct of trait curiosity. These researchers assumed that curiosity is stable within individuals, and that individuals differ in the pervasiveness and intensity of the curiosity drive. A highly curious person would show greater interest in seeking out new experiences and would spend more time exploring stimuli than a less curious person. Also part of the definition of trait curiosity is the "tacit assumption that different types of exploration are indicative of a unitary construct" (Henderson & Moore, 1979).

There are two different conceptions of trait which are represented in the literature. The traditional variance-trait notion makes use of correlational and factor analytical techniques. Separate item scores which correlate with each other are assumed to measure a common trait such as curiosity. The composite version of trait assumes that an individual's behavior in several different situations (e.g., items) can be added up to yield an over-all curiosity score, but performance across situations is assumed to be independent. Ratings and rankings of people in specific situations are used to form composite measures (e.g., Maw & Maw, 1961).

Teacher Ratings of Curiosity. Maw & Maw (e.g., 1961) isolated criterion groups of children high and low in curiosity in the following way. Teachers of fifth grade classes were asked to judge the curiosity of their pupils in reference to the following four-part definition: "Curiosity is demonstrated by an elementary school child when he: 1. reacts positively to new, strange, incongruous, or mysterious elements in his environment by moving toward them, by exploring them, or by manipulating them, 2. exhibits a need or desire to know more about himself and/or his environment, 3. scans his surroundings seeking new experiences, and/or 4. persists in examining and exploring stimuli in order to know more about them" (Maw & Maw, 1961). These authors have developed curiosity rating scales to be used by teachers and peers, as well as by children themselves (Maw & Maw, 1964, 1968, 1972). Test-retest reliability of the teacher ratings was reported as .77 among seven classrooms (Maw & Maw, 1964).

Minuchin (1971) correlated teacher ratings of curiosity with subjects' behavior in experimental settings. In a study involving 18 Head Start children, the experimenters observed youngsters participating in new experiences which were part of the ongoing school program. These included class trips to new places as well as new activities. Each child's behavior was recorded in narrative form, and then coded. In addition, an object-curiosity score was obtained for each child, based on his or her reaction to a kaleidoscope. The study was conducted in two different Head Start centers with two different teachers (hereafter to be referred to as Centers A and B and Teachers A and B). Children's exploratory behaviors in both an experimental and naturalistic setting were found to correlate with teacher ratings of their children's curiosity, although on some measures there were significant differences in correlations between teachers. Correlations reported were .38 and .55 for Teachers A and B respectively in comparing teacher ratings to observations in new preschool situations, and .32 and .67 in comparing teacher ratings to measures of object curiosity on a kaleidoscope task. There were also correlations of .91 and .86 between centers A and B respectively in comparing observer rankings to observations in new preschool situations, .68 and .93 in comparing observer rankings to measures of object curiosity on the kaleidoscope task, and .28 and .76 in comparing observer rankings to teacher rankings (Minuchin, 1971, p. 945).

Coie (1974) also examined teacher rankings of curiosity. Teachers ranked a total of 120 youngsters randomly selected from the first- and third-grade classes of a public school. Teachers' rankings were obtained using Maw & Maw's (1961) scales. The experimenters observed the children in four kinds of curiosity-evoking situations. They included: (1) a box task, in which children were allowed to explore a box equipped with lights, buzzers, and levers, (2) a chemicals task, similar to the one used by Inhelder & Piaget (1958), (3) a bird display, in which children's reactions to bird cages were observed, and (4) an inclined plane task, where a conceptually perplexing phenomenon was presented to the subject (i.e., a ball rolling uphill) and the subject was invited to try to figure out why it had occurred. Following the completion of the last task, each subject was administered the vocabulary subtest of the WISC. The two basic types of data were obtained from each curiosity task: latency of approach (in seconds) and number of exploratory activities. Analysis of data revealed that teachers' ratings of their students' curiosity on all or combined scores were highly correlated with WISC vocabulary scores. Boys who were viewed as more curious by their teachers obtained higher scores on the WISC vocabulary than boys who were rated as less curious. However, the authors concluded that results provided little support for considering curiosity as a unitary trait, since teacher measures did not correlate with situation measures, and, in addition, the situational measures did not correlate highly together.

In a study with middle-class children, Cook and Cohen (1978) obtained a single curiosity score based on teachers' ratings of children's curiosity, using scales based on the ranking scales developed by Maw and Maw (1961) and later refined by Coie (1973). The four rating categories of Maw and Maw's questionnaire were used. Correlations between teachers' ratings in the same classroom were relatively high (.74). The experimental apparatus consisted of a "curiosity box" with various items attached. Subjects' manipulatory curiosity responses were recorded by two raters. The total number of manipulations served as the dependent variable. There was no significant correlation between the rankings and observed exploratory behavior in the experimental setting. The authors suggested that rankings of children were not predictive of children's exploratory behavior in an experimental setting.

An assumption which underlies trait notions of curiosity is that teachers can accurately rate children's general levels of curiosity in a way that is distinct from their other characteristics. Several researchers have taken exception to this assumption. There is evidence (Kelly, 1955; Cronbach, 1955, 1958) that trait notions to some extent reflect the perceiver's general beliefs about another person and have trouble separating out particular subtle characteristics or responses such as curiosity. The findings of various researchers (e.g., Maw & Magoon, 1971; Minuchin, 1971; Coie, 1974; Cook & Cohen, 1978) that teachers' ratings of children's curiosity significantly correlate with other characteristics such as intelligence, grade point average, and socio-emotional adaptation raises questions concerning the "discriminant validity" of so-called trait curiosity (Campbell &

Fiske, 1959).

In addition to the argument of trait attributions made on the basis of teachers' general notions about a student, it has also been argued that trait attributions are made on the basis of only a subset of a person's actions or performance (Mischel, 1973). Teachers generally do not see children's total behavior. Their ratings reflect performance within a classroom setting. These are contextually derived judgments that do not necessarily correlate across situations.

The present study sought to further assess the validity of using teachers' perceptions of children's curiosity to predict exploratory and problem finding behavior. The teacher ratings used in the present study were based on Maw and Maw's (1961) four-part definition. However, a rating scale similar to the scale used by Cook and Cohen (1978) was developed in order to allow teachers to make absolute judgments about their children's curiosity rather than relative judgments (See Appendix A). While there was no commitment to a trait conception of curiosity, there was an interest in determining whether teacher ratings were predictive of children's responsiveness in this situation.

Toward a Differentiated Construct of Curiosity: Correlational Studies. Some researchers in the field of curiosity have concluded from their findings that different types of curiosity are too diverse to be considered together as a unitary trait and have therefore opted to treat curiosity behaviors as unrelated state variables (Henderson & Moore, 1979; Kreitler, Zigler & Kreitler, 1975; Coie, 1974; McReynolds, Acker & Pietila, 1961). Other researchers are impressed by the size of correlations between the various response measures, and therefore regard curiosity as a unitary construct, i.e., as a trait variable (Maw & Maw, 1968; Minuchin, 1971). Evidence bearing on these two views of curiosity is discussed below.

The factor analytic studies address themselves to two basic issues, namely, the amount of variance accounted for by a single overall curiosity factor, and the amount of variance accounted for by a series of smaller factors. Descriptions of people in terms of multiple factors imply the importance of state personality factors. Langevin (1971) tested the hypothesis that curiosity is a unitary trait. Various measures of curiosity were compared. Langevin compared the performance of 195 sixth-grade boys and girls on Day's Test of Specific Curiosity, McCann's Test of Reactive Curiosity, Maw & Maw's Teacher Ratings of Curiosity, Interest in Complexity Test, and the Experiential Curiosity Test which consisted of three scores (diversive curiosity, exploration time, and number of questions). Langevin found most of these measures to be uncorrelated (only 10 out of 35 correlations appeared significant at the .05 level or more). An unrestricted maximum likelihood factor analysis yielded two relatively weak factors. A "breadth of interest" (cursory examination of many objects) factor accounted for 12.5% of the total variance while a "depth of curiosity" (detailed examination of fewer objects) factor accounted for 6.6% of the total variance. Langevin concluded that the levels of intercorrelations of all the curiosity measures used in his study were relatively low and did not form a unitary factor. A factor analytic study by Kreitler, Zigler and Kreitler (1975) revealed individual variations in amount as well as type of exploratory behaviors of first-grade children in response to five different experimental tasks which measured preference for complex and simple stimuli, preference for the unknown, structure of meaning, and object exploration. A normalized varimax factor analysis extracted five factors: manipulatory curiosity, perceptual curiosity, conceptual curiosity, curiosity about the complex, and adjustive-reactive curiosity. The most prevalent dimension was manipulatory curiosity, defined as the total number of manipulations of a given stimuli. Kreitler et al. (1975) came to conclusions very similar to Langevin's conclusions (1971). They disputed the notion that curiosity is a unitary construct and that therefore trait constructs of curiosity can account for much of the variance in experimental endeavors. Kreitler and colleagues suggested that behavioral theories of curiosity be explored.

Coie (1974) studied covariation in the performance of first- and third-graders on a variety of curiosity tasks. They included: (1) a box task, in which children were allowed to explore a box equipped with lights, buzzers, and levers, (2) a chemicals task, similar to that used by Inhelder and Piaget (1958), (3) a bird display, in which children's reactions to bird cages were observed, and (4) an inclined plane task, where a conceptually perplexing phenomenon was presented to the subject (i.e., a ball rolling uphill) and the subject was invited to try to figure out why it had occurred. Teacher ratings of the children's curiosity were also solicited. The subjects' performances on the various tasks were found to be unrelated to each other and none of the performances were correlated with teachers' ratings.

Henderson and Moore (1979) attempted to study the trait-state character of curiosity by utilizing a battery of four situational tasks. They interpreted the outcomes according to a single trait theory. In their study, pre-school boys and girls, ages 3½ to 5 years, and first- and second-grade girls were administered a battery of four tasks including preference for complexity, preference for the unknown, a curiosity drawer box, and a puzzle box. Factor analyses of the intercorrelation matrix for the variables in each group were computed and compared. Five factors were identified: exploration of highly novel stimuli (with 20.4% of the variance accounted for), breadth of curiosity (18.5%), depth of curiosity (12.8%), a questionnaire factor, a venturousness-timidity factor (9.7%), and an age factor (7.8%).

Henderson and Moore (1979) provided additional support for Langevin's (1971) and Kreitler _et al._'s (1975) conclusions about curiosity. They concluded that "different types of curiosity are not a manifestation of a single underlying construct," and that individual differences in exploratory behavior are due to differences in mode of response (e.g., manipulation, question asking), in style of exploration (breadth, depth), and in the elicitors of exploratory behavior (novelty, the unknown). The authors concluded:

> Curiosity and the predispostion to explore is obviously a complex dimension of human behavior that for some children may be pervasive enough across situations to be considered a trait. For other children curiosity is aroused by selected elicitors and is expressed in selected modes and styles...future research in the measurement of curiosity will require careful attention to both the individual differences in children and the characteristics of the stimuli to be explored (Henderson & Moore, 1979, p. 119).

A Social Learning Approach

The limitations of the behaviorist and trait-state models have been discussed in previous sections. Neither model considers a reciprocal interaction of the organism with the environment. The social learning model does allow for such reciprocity. It posits the need to study the impact of the naturalistic context as a stimulus for cognitive problem finding and curiosity. In social learning theory, there is particular concern about the linkages between the social stimuli in the naturalistic context and of the behavior of models. This section will explore the concept of curiosity within a social learning framework.

Drives Versus Learned Skills. In most of the literature on curiosity, researchers have inferred an internal state of arousal (curiosity) from specific exploratory behaviors. Typically, concepts of intrinsic motivation have dealt with stimulus seeking and information-processing activities (Haywood & Burke, 1977). This class of response is important in its own right (regardless of internal state) because it indicates active efforts on the part of the individual to manipulate his environment in order to learn more about it.

In a review of the literature, Haywood and Burke (1977) suggested that there are two types of variables which might be expected to affect a child's development of intrinsic motivation. The first type, perhaps biological in nature, is referred to as the "orienting reflex" (Hunt, 1965). The authors cite research in visual exploration of infants as evidence of individual differences in attention to novel and complex stimulus patterns. The second type, "experimental" in nature, includes: "number and sequence of different new complexes of stimulation available to individuals, and that set of events that

Berlyne (1960, 1963, 1966) has referred to as the collative variables...which of course will interact with their own individual levels and qualities of cognitive development at any given time" (Haywood & Burke, 1977, p. 252).

The various types of "experimental" milieu mentioned above are assumed to influence both the internal state as well as classes of exploratory behavior which can be referred to as skills. The acquisition of these skills can also be in part explained by the social influences on the developing child.

The following concept of intrinsic motivation by Calder and Staw (1975) might well be applied to the theory of state epistemic curiosity as conceived of by Berlyne:

> The most serious problem is that the phenomenon is merely named, not explained. Labeling a behavior as intrinsically motivated begs the question of the theoretical nature of the process through which the behavior has become a motive. The second problem is that there are other theories which might plausibly explain the phenomenon (Calder & Staw, 1975, p. 599).

The charge of "drive-naming" can also be directed at Berlyne's early writings (Deci, 1975; Hunt, 1960). Hunt stated: "Such naming of drives, needs, and urges seems to revisit the instinct-naming of McDougall...Even though they are mere logical shuttles, they may delay the thought and investigation required for genuine understanding." (Hunt, 1960, p. 195). Berlyne later attempted to rebut such criticisms by proposing that the purpose of many intrinsically motivated behaviors is to establish rewarding internal states (Berlyne, 1971). In this way, Berlyne was moving toward a consideration of antecedent-consequent relations of curiosity development. Berlyne also discussed some processes underlying epistemic curiosity: "...rehearsing to oneself symbolic responses copied from teachers, asking questions, and observing" (Berlyne, 1965a, p. 77). While Berlyne did allude to modeling when discussing the acquisition of curiosity behaviors by school age children, he did not acknowledge the possibility that these behaviors might be acquired early in life through social learning. Social learning theory raises the questions of whether the emergence and display of epistemic behaviors can be explained by referring to the social processes of modeling, reinforcement, and/or verbal tuition.

Bandura stated: "Except for elementary reflexes, people are not equipped with inborn repertoires of behavior. They must learn them" (Bandura, 1977b, p. 16). The result is a "combined effect" of physical or biological factors and environmental or learning influences. According to Bandura, state epistemic curiosity, which is usually considered to be a type of intrinsic motivation (Berlyne, 1965b; Deci, 1975), may not be an initially intrinsically motivated phenomenon, but it may become so due to such phenomena as secondary reinforcement and/or modeling influences. Saxe and Stollack (1971) stated: "...events associated with exploration serve as conditioned stimuli to elicit curiosity. Social learning theory...suggests that children may learn to imitate the curiosity behavior of their parents" (Saxe & Stollack, 1971, p. 374).

Deci (1975) has commented on the possibility that many activities can become intrinsically rewarding (or self-motivated) despite the "extrinsic" aspect of their initiating motive. Bandura stated: "...the development of self-motivation and self-direction requires certain basic functions that are developed through the aid of external incentives" (Bandura, 1977b, p. 104). Modeling has also been demonstrated to have an effect on developing patterns of action and self-reinforcement in children (Bandura & Kupers, 1964).

A Social Learning Analysis. According to social learning theory, most behaviors are substantially acquired through modeling, verbal tuition, and response consequences (Bandura, 1971). As described more completely in an earlier section, there are three basic sources of causation in a social learning analysis of functioning--cognitive, behavioral, and environmental. There is a "continuous reciprocal interaction" between the various determinants of behavior, where the individual's striving for self-efficacy influences his actions as well as his cognitions of the effects of his actions (Bandura, 1977a).

Bandura (1978) has enumerated many conditions in which people may fail to act in a given situation even if the response is available in their repertoire. Within the social learning framework, a child is expected to become inhibited if (1) he receives punishment for his exploratory behaviors, or (2) he observes others receiving punishment for their exploratory behaviors. In addition to direct or vicarious punishment, some children simply might not be exposed to models who exhibit curiosity or problem finding behaviors in appropriate situations. According to social learning theory, since such children have not been exposed to such behaviors, they have much less chance to learn them. The possibility that exploratory behaviors might also come under the influence of aversive stimulus control has not been empirically approached, although it has been alluded to in the writings of various educators (Holt, 1964; Kohl, 1967).

Individual Differences. An issue of concern to educators which has not yet been adequately considered in the existing literature on epistemic curiosity and problem finding is the social origin component of individual differences. Minuchin (1971) tried to identify the social origins of individual differences in exploratory behavior. She found that six out of the eighteen Head Start children included in her study sample did not show evidence of curiosity behaviors either in the laboratory or in the classroom setting. Minuchin concluded:

> ...the data point to a "developmental high-risk" group within the disadvantaged preschool population. There were children whose image of themselves was diffuse, who projected an environment characterized by sustained crisis, little coherence, ineffective and poorly defined adults, and whose conceptual grasp of order in the physical environment and of relationships among objects tended to be poor. These children also showed limited curiosity or exploratory behavior (Minuchin, 1971, p. 929).

Minuchin suggested that the "exploratory drive" was probably present to begin with, but may have been extinguished by other factors. This analysis points to the possible contribution of social origin variables to the development of individual differences in exploratory behaviors.

The findings of individual differences between children on measures of curiosity, in addition to the theoretical basis within a social learning paradigm, suggest that the construct of curiosity can be explored and theories of the etiology of exploratory behaviors can be expanded through modeling studies. The next section will review modeling studies in curiosity.

Research Findings on the Effect of Modeling on Curiosity and Related Behaviors

To date, while there are many studies indicating that a model's behavior affects a wide variety of problem solving behaviors, there are only four modeling studies dealing with curiosity and exploratory behaviors, and no modeling studies in the area of problem finding and defining. The literature concerning the effects of modeling on problem solving behaviors has been reviewed in detail (Rosenthal & Zimmerman, 1978). Model effectiveness has also been demonstrated on alteration of subjects' cognitive tempo (Ridberg, Parke & Hetherington, 1971), information-processing strategies (Denney, Denney & Ziobrowski, 1973; Lamal, 1971; Laughlin, Moss & Miller, 1969), creative problem solving (Zimmerman & Dialessi, 1973; Arem & Zimmerman, 1977), and perseverence in problem solving (Berger, 1971; Zimmerman & Blotner, 1979; Zimmerman & Ringle, 1981). Rosenbaum and Arenson (1967) found that the effect of modeling on problem solving behavior was so strong that observers adopted models' solutions even when they were inefficient and actually hindered problem solving activity.

Several studies have supported the notion that children tend to ask more questions after observing a model asking questions. Zimmerman and Pike (1972) found that praise alone did not consistently increase the frequency of question-asking behaviors of seven-year-old subjects, but that a combination of praise and modeling increased question frequency. Henderson, Swanson and Zimmerman (1975) found that preschool Native American children who were exposed to a television model asked more questions than children in a control group.

As early as 1948, Baldwin suggested that a high level of interaction between parents and children is a necessary condition for active exploration of the environment by the child. There is a limited amount of research which directly examines the effects of maternal behaviors on children's exploratory behaviors. Ainsworth (1970) found that separation from the mother, the object of attachment, caused distress that interfered with exploration. Rubenstein (1967) observed four-month-old infants with their mothers in their homes. Time sampling methods were used to determine how frequently the mother looked at, touched, held, or talked to her baby. The infants were given two tests of exploratory behavior at age six months. Infants who received much attention from their mothers consistently explored more than children in the low attentiveness group. Rubenstein concluded that maternal attentiveness is related to an infant's exploration.

Rubenstein's (1967) study was correlational in nature and therefore a causal relationship between maternal attentiveness and infant exploration could not be established. Saxe and Stollack (1971) also conducted a correlational study, examining the relationship between mothers' curiosity and their sons' exploratory behavior. Mother and son dyads were observed by two raters in a playroom containing standard playroom toys as well as novel objects. One rater recorded the parents' behaviors, while the second rater observed the child's behaviors. The adult behavior categories included attentiveness to the child, expression of feeling, restrictiveness, and responsiveness. Child behavior categories included observation, object manipulation, information seeking, number of objects manipulated, number of novel objects manipulated. It was found that the behaviors of the mothers were highly correlated with their sons' behaviors. Highly curious mothers had highly curious sons.

Haskett and Lenfesty (1974) attempted to establish a causal relationship between models' curiosity and children's curiosity. They examined the effects of modeling on reading-related behavior in preschoolers. It was found that subjects showed more curiosity about books after they were exposed to "tutors" who modeled curiosity behaviors in reference to new books in the classroom. This study does not examine the specific exploratory strategies employed by children in seeking out new books or experiences, but it does support the notion of causality.

Johns and Endsley (1977) studied the short-term effects of a mother's tactual curiosity behaviors on the child's subsequent behaviors. Subjects ranged in age from 45 to 72 months. There were three experimental conditions:

> (a) Model Curiosity (MC)--a group in which the mother modeled a specific set of tactual curiosity behaviors; (b) Model Non-curiosity (MNC)--a group in which the mother modeled a specific set of noncurious behaviors; (c) Control (C)--a group in which the mother was present but did not model either the curious or the noncurious sets of behaviors (Johns & Endsley, 1977, p. 22).

Mothers in the MC condition performed a modeling sequence twice each with three objects (a pine cone, a thread-spool, and a flower). The modeling sequence consisted of (a) picking up the item, rubbing it across the arm, and setting it back on the table; (b) pausing; (c) picking up the item, holding it to the eye, looking at it, and setting it back on the table; (d) pausing; (e) picking up the item, holding it to the ear and shaking it, setting it back on the table. For all three conditions, the experimenter said to each subject, "My, look what is on that table," to draw attention to the stimulus items. Results revealed that children in the MC condition displayed significantly more curiosity in responding than children in the other two groups. There was a significant effect for males, nonsignificant for females. The authors pointed to an artificiality in the mothers' behaviors, to which girls perhaps had more trouble relating than boys. In addition, the model's behaviors appeared to be diversive and unfocused, unlike the more specific problem finding behaviors one might observe in an older child.

A number of researchers have investigated adult influences on exploratory behavior. Moore and Bulbulian (1976) found that an emotional atmosphere of adult acceptance and supportiveness of the child had a significant effect on exploratory behavior. Ten nursery school boys and ten girls were assigned to a friendly-approving adult condition or to an aloof-critical condition. The authors found that preschool children touched and manipulated objects less in the aloof-critical condition than in the friendly-approving condition. Henderson and Moore (1980) studied adult-interactive style conditions on children's exploratory behaviors. The treatment conditions included: (a) a demonstration condition, in which an adult model described and modeled three manipulations with three objects (two novel toys and a conventional toy); (b) a responsive condition, in which the adult invited the child to do anything he or she would like to do with the toys. The adult then reinforced the child's autonomous exploration, but did not offer comments or questions, merely asked, "What do you think?" to encourage the child's exploration; (c) an unresponsive condition, in which the adult was inattentive, and (d) a conventional toy condition, which controlled for the effect of the novelty of the toys in the other three conditions. The adult's behavior was basically responsive, but no effort was made to encourage exploration. It was found that interactive style had no impact on children's exploration.

Model Affect

The issue of the effects of model affect on curiosity behaviors has not been examined. Bandura (1969) proposed that: "...modeled affective cues produce vicarious arousal largely through an intervening self-stimulation process involving imaginal representation of aversive or pleasurable consequences occurring to oneself in similar situations" (Bandura, 1969, p. 171). To date, four studies have lent support to this notion. Bandura and Rosenthal (1966) found that vicarious conditioning was related to degree of psychological stress. Subjects were exposed to feigned pain responses of a model and were classically conditioned to display more affect in response to the auditory stimuli which were present at the time of the model's response. Lerner and Weiss (1972) found that the model's affective response to a reward was responsible for the acquisition of vicarious reinforcement. In addition, positive model affect was responsible for significantly more imitative behavior than negative model affect, although both were significantly more effective than the actual reward given to the model. Venn and Short (1973) found that children based their toy preference and use on model's emotional responses to toys. Both positive and negative affective responses of the model were effective in altering behavior. Zimmerman and Koussa (1979) found that children's preferences for toys were more influenced by model affect than the rewarding behaviors of the model toward the child. They concluded: "A model's emotional cues would appear to be a more situationally specific type of information than his rewardingness since the latter variable theoretically would transcend a particular setting" (Zimmerman & Koussa, 1979, p. 64).

The foregoing indicates a need for further research on the affective qualities of a model on problem finding exploratory behaviors. The following section will examine the various methodologies employed in investigating curiosity and exploratory behaviors.

Methodological Issues: A Construct in Search of a Task

Curiosity has traditionally been regarded as an internal state of those persons who exhibit exploratory behaviors. The general model implied in theories of epistemic curiosity can be described as (1) a stimulus, which elicits (2) arousal, which acts as a catalyst for (3) search behaviors. The stimulus is presented by the experimenter, the search performed by the subject. The experimenter infers degree of arousal from the length and varieties of search behaviors performed by the subject. Curiosity as an internal state is a construct, a concept adopted by the experimenter for the purpose of investigation (Kerlinger, 1967). The definition of a construct is dependent on the operational definitions developed by each investigator. In most of the literature on curiosity, researchers have inferred an internal state of arousal from specific exploratory behaviors such as preference for one stimulus over another, time on task, latency of first touch, amount of incidental learning, and so forth. These classes of response are important in their own right (regardless of internal states) because they indicate active efforts on the part of the learner to manipulate his environment in order to learn more about it. An alternative position is to focus on the classes of behaviors which have been considered to reflect curiosity rather than on the internal state itself. In the present study the class of behaviors described as exploratory behaviors are considered to be skills. The acquisition of skills can be explained in part by the social influences to which one has been exposed.

The bulk of the research in the field of curiosity has been aimed at establishing peoples' preference for novel, surprising, or complex visual stimuli. In many of these studies, the subject has been given a choice of exposure to one of two stimuli. Such "free choice" has been accomplished through the subject's control of a tachistoscope, which presents exposures of visual figures varying in degree of surprisingness and complexity (e.g., Berlyne, 1957, 1958; Pielstick & Woodruff, 1964). This basic approach has been repeated many times, with buttons, filmstrips, levers, and actual pointing out of preferred objects (Berlyne, 1963; Cantor & Cantor, 1964, 1966; Smock & Holt, 1962; Kreitler, Kreitler & Zigler, 1974). Preference for novel versus familiar aural stimuli was assessed with the use of a makeshift "jukebox," where the subject again was given a "free choice" in object preference (Brickman & D'Amato, 1965).

Curiosity has also been assessed by the amount of time spent in "exploratory play behavior" with three dimensional random polygon objects (Switzky et al., 1974), and an "object box" and a "free play box" containing objects of varying novelty and complexity (McReynolds *et al.*, 1961), and a kaleidoscope (Minuchin, 1971). Minuchin (1971) also recorded children's reactions to a new preschool setting.

Most of the studies cited above add very little to the understanding of Berlyne's concept of epistemic curiosity. The fact that the subject chooses to view (or "explore") a more complex object or to draw a less complex object tells us that this particular subject indeed prefers the more complex object. However, observations of subjects in these situations reveal little about: (1) whether the subject would attend to *any* of the stimuli if he had not been requested to do so by the experimenter, (2) whether the subject actually "wants" to gain knowledge about the object, and (3) the particular exploratory goals held by the subject in his "quest for knowledge." In the studies cited above, some actions (e.g., time viewing a stimulus) of the subjects were recorded, but there was little attempt to explore covert processing. Epistemic curiosity implies inner processes. It is by definition purposive. It involves information-seeking, questions about a conceptual dilemma or problematic situation, and/or a need to resolve uncertainty. The above studies have assumed differences in internal processes from the *overt* actions of the subjects (e.g., exploratory behaviors, correct responses to questions, etc.). What is needed is a procedure which will allow the researcher to uncover the subjects' inner processes in relation to specific task stimuli and external behavior. The present study was directed toward that end.

Epistemic curiosity has also been defined as amount of relevant and instrumental learning in response to various presentations of prose materials. The earliest study of this type was conducted by

Berlyne (1954). Sixty-eight college students were assigned to one of the three following conditions: (1) a prequestionnaire about invertebrate animals, (2) a series of statements including answers to the questions on the posttest, and (3) a post-questionnaire, repeating the questions of the pre-questionnaire. It was found that pre-questionning arouses curiosity, which was operationally defined as improved performance on the posttest. Frick and Cofer (1972) replicated and extended the study. They used a second control group, which was administered irrelevant questions. Their findings were in agreement with Berlyne's (1954) study.

However, one study utilizing prose materials in the study of epistemic curiosity did seem to be more suited to an examination of the construct as conceptualized by Berlyne. Bull and Dizney (1973) varied the types of questions administered to two experimental groups. The subjects read an article by Margaret Mead and took a retention test one week later. A high curious question was meant to pose some type of conflict in the subject matter (e.g., "If teachers are generally viewed as middle class, why was it the Balinese of high caste who sent their daughters to be educated?"). A low curious question merely directed the subject to find a factual solution. Retention on the passage was assessed by multiple choice tests. It was found that subjects given high-curious questions performed better on the test than subjects given low-curious questions.

The above study did allow the researcher to infer epistemic curiosity from conflicting versus nonconflicting questions. The subjects given high-curious questions remembered more of the reading material, possibly as a result of a more careful reading of the material in order to resolve the dilemmas as stated in the questions. However, the above study still does shed much light on the internal processes involved. In order to explore the internal processes in detail, one might want to observe subjects performing tasks in a situation which is more amenable to direct observation and analysis. In the studies utilizing prose materials, it is necessary to do a great deal of inferring about internal processes since overt responses are not very distinctive. What is needed is a setting in which distinctive behaviors that can be subjected to some kind of systematic analysis can be observed, as well as some type of measure of the accompanying internal state.

In a better controlled study using prose materials, Berlyne (1966) exposed the children to a series of stimulus categories which involved stories and pictures. The children were instructed to ask questions after each item. The stimulus materials consisted of four different types of activities. Category A contained a novely item. Aesop's fable, "The Fox and the Raven" was used, with two unfamiliar animals, "tayra" and "auk" substituted for "fox" and "raven." Category B contained a surprise item. For example, there was a picture of a boy holding up a wall, which fell down when he walked away. There was also an incongruity item, Category C, which consisted of items such as a picture of a horse with an elephant's head. Curiosity was operationally defined as the number of questions asked by the children. This study satisfies a few more criteria than the previous studies, in that the materials were clearly surprising, and the task called for question-asking behaviors. However, the study also had some serious limitations. First, there was no control group, so that the question-asking behaviors of subjects exposed to more conventional stimuli could not be compared to the group receiving the experimental treatment. Second, subjects were actually encouraged to ask questions. They therefore might have been influenced by the requirements of the situation rather than by their own curiosity about the incongruous items.

Considering the abundance of curiosity research, there is a paucity of investigatory research utilizing tasks which provoke search and/or inquiry behaviors on a sophisticated enough level to be considered either a purposive quest for knowledge or for definition of a problem. The following studies do satisfy this criterion, in that they present conceptual dilemmas or problematic situations which call for some sort of solution.

Charlesworth hypothesized that: "...the more precise and concrete the expectation, the greater the surprise and reaction and hence curiosity motivation" (Charlesworth, 1964, p. 1170). His study created the element of surprise utilizing a task which involved a violation of conservation of substance, producing a nonconfirmation of expectancies. Marbles were inserted into a box in one order, and were randomly ejected in a different order. Curiosity motivation was inferred by the subject's persistence in playing with the experimental game. Those subjects who were exposed to the nonconfirmation of expectancies condition played the experimental game significantly longer and exhibited more facial surprise than those subjects who observed the marbles exit in the same order in which they entered. The author concluded that surprise is an important motivational factor in curiosity development. However, there is no evidence in this study that the subjects desired to resolve this conceptual dilemma in any way, merely that they enjoyed the surprising aspects of the task.

A study which utilized interesting and problematic tasks was reported by Coie (1973). He felt that Berlyne's definition of epistemic curiosity required, in addition to task properties of novelty and complexity, that the person experience some degree of cognitive conflict. He stated:

> ...epistemic curiosity is aroused by external conditions that disrupt the ongoing flow of behavior because they present contradiction to existing cognitive expectancies. The investigation of epistemic curiosity calls for experimental paradigms that pose genuine discrepancies from a child's conception of the world, rather than brief novelty or visual complexity (Coie, 1973, p. 180).

In order to study children's reactions to a task which presented what Coie considered to be a "genuine discrepancy," and then compare these reactions to novel and complex curiosity-evoking stimuli, Coie (1973) devised four tasks. The four tasks, reviewed in an earlier section of this paper, included a bird display, a box task, a chemicals task, and an inclined plane task. The inclined plane task was the only task which actually presented a contradiction to already existing cognitive expectancies, as described in the above quotation. This task will be described here. On a table was an inclined plane, a small wheel made of two plywood discs, and a small steel rod. The experimenter first showed the subject that the wheel by itself would roll down the inclined plane. Then, when the rod was placed in off-center holes in the spokes of the wheel, the wheel would roll to the top-heavy side. And finally, when the rod was still in the holes and was placed on the incline with the rod on the uphill side of the wheel, the wheel would roll uphill slightly and stay in that position. Following this demonstration, the experimenter gave the materials to the subject and asked if he could figure out how the apparatus worked. A precoded observation form was used. The critical issue was what the subject did with the objects provided rather than how long he stayed with a particular activity. In other words, the dependent variable became quality of exploration rather than latency or quantity of time spent exploring.

In a similar vein, Cook and Cohen (1978) developed a task which allowed them to measure subjects' manipulatory curiosity, defined as the total number of manipulations of a given stimulus. To elicit curiosity behaviors, a "curiosity box" was constructed, with a large wooden crank on one side which turned a muticolored wheel. Various switches, buzzers and bells were attached. Children were left alone in a room with the apparatus and were told that they could play with "anything" in the room. Raters recorded all of the child's activities with the box on a checklist consisting of all the possible manipulations of the box. Categories included touching, turning, opening doors, and looking at the various parts of the apparatus. The total number of manipulations served as the dependent variable. In this study, an attempt was made to consider quality as well as quantity of exploratory behaviors.

While Cole's (1973) inclined plane task and Cook and Cohen's (1978) curiosity box represented a major methodological advancement in the investigation of curiosity, there were a few limitations to these studies. The most outstanding limitation of Cole's (1973) study involved the instructions given to the subject on the chemicals and the inclined plane tasks. Subjects were introduced to a problem and were then instructed to explore the objects. Such instructions blur the distinction between curiosity tasks and problem solving tasks. The concept of epistemic curiosity implies that one is self-motivated to seek out and solve a given problem (Berlyne, 1960; Nunnally & Lemond, 1972). When an experimenter asks a subject to pose questions or solve a problem, the behaviors under investigation can no longer be considered to be reflective of epistemic curiosity. Such tasks are better described as question asking and/or problem solving.

The next section will explore those conditions necessary for further research in the areas of epistemic curiosity and problem finding.

Future Research: Rationale and Improved Methodologies

In light of the foregoing discussion, there are many issues to consider before attempting further research in the areas of epistemic curiosity, exploratory behaviors, and/or problem finding. First it is necessary to make a clear distinction between them. The terms curiosity and exploratory behaviors have often been represented as one and the same. A distinction between the two needs to be made. Livson (1967) stated: "It is useful, although possible with some considerable conceptual strain, to maintain a distinction between definitions of curiosity as a motivational construct on the one hand and as a class of adaptive behaviors on the other" (Livson, 1967, p. 74). What is needed is a task which will allow observation of specific and purposive behaviors which can be conceptualized as specifically designed to reduce uncertainty. However, much of human behavior is covert. In order to identify a covert internal state, it may be necessary to ask questions of the subject, to ascertain precisely what he intended to achieve by his actions. Bandura (1977b) has recommended probing cognitive dimensions of behavior with self-report attitude measures or interviews. To my knowledge, only one researcher in the entire literature on epistemic curiosity has attempted to ascertain the internal states of her subjects during the experimental treatment by use of questionnaire. Leherissey (1971) developed the State Epistemic Curiosity Scale (SECS) for this purpose, to probe into the subject's feelings and cognitions about a curiosity task. This measure is purely introspective in nature. Alpha reliabilities ranged from .81 to .96, indicating high internal consistencies on the short and long form of the scale. The alpha reliability of the SECS was found to be .89. The SECS had a moderately high positive correlation with a self-report measure of trait curiosity. However, upon examination, it appeared that the SECS might trigger reactivity from respondents by asking "leading" types of questions about internal knowledge states. The need to preclude the possibility of cueing particular responses (social desirability) on personality inventories has long been a concern of psychometricians (e.g., Anastasi, 1968). In the present study, it was decided that a more open ended series of questions would be preferable.

The literature on problem finding has been limited to subjects who have shown proficiency in certain types of formal operational problems. As discussed earlier in this paper, it is possible to conceive of problem finding behaviors emerging at an earlier point in development. Problem finding behaviors of seven- and eight-year-old children will be examined in this study.

Another limitation of the problem finding research to date is methodological. An essential element of problem finding as defined by Csiksentmihalyi and Getzels (1970) and Arlin (1975) is intrinsic or self-motivation. In both curiosity and problem finding research, the subject should be able to choose: (1) whether or not he is going to attend to certain stimuli, and (2) the properties of the stimuli to which he will attend. Further, a person might conceivably be motivated to explore a problem, but might not have the necessary skills to engage in exploratory behaviors. Therefore, both motivational aspects as well as exploratory strategy skills must enter into an operational definition of epistemic curiosity.

A Proposed Operational Definition. It has been stated that problem finding exploratory behaviors (1) are purposive, (2) represent a quest for knowledge in response to uncertainty, complexity, and/or a problematic situation, and (3) involve thinking and question-asking. Therefore, in order to operationalize epistemic curiosity and its subsequent exploratory behaviors, it is necessary to develop a task which presents (1) a novel, surprising, and/or complex situation, (2) a situation which might be considered a problem, but where the problem is not actually posed by the experimenter to the subject, and (3) a situation which calls for purposive thinking, exploratory behaviors, and question-asking on the part of the subject. In addition, the experimental condition should contain an element of informality. The subject should not be aware that he is a subject in a psychological experiment (as far as that is possible), but rather, that he is in as close to a naturalistic setting as possible.

As stated earlier, there is a paucity of research utilizing observable search and inquiry provoking tasks. Given the above conditions, it might now be possible to begin to explore problem finding behaviors and strategies as observed variables.

CHAPTER III

METHOD

In the present study, the effects of a model's exploration and affect on children's curiosity responses in an experimental setting were investigated. It was postulated that specific exploratory behaviors can be acquired through social learning. In addition, hypotheses about social learning based on the affective cues of a model were tested. There has been no previous research on the effects of model affect on curiosity. However, Berlyne's theoretical formulations concerning model affect as well as research findings of studies investigating the effect of model affective cues on other behaviors has allowed for the formulation of hypotheses bearing on the acquisition of curiosity behaviors.

The relationship between teachers' perceptions of children's general (trait) degree of curiosity and their performance on the experimental task was also investigated. Research on this issue has been equivocal. Minuchin (1971) found positive correlations between degree of exploratory behaviors in both experimental and classroom settings and teacher ratings of curiosity. Langevin (1971) and Coie (1974) found no significant correlations between children's performance measures of curiosity on experimental tasks and teachers' general ratings of their curiosity. The experimental task in the present study differs in content from the type of exploratory opportunities available in classroom settings. However, since the subject was performing the experimental task within a classroom setting, a significant correlation was expected between teachers' ratings and observed behavior.

Finally, the possibility of a relationship between epistemic curiosity as a separately measured internal state and observed exploratory behaviors was considered. This relationship has never been directly addressed in prior research. A relationship between curiosity as a global concept and as an impetus to problem finding behaviors has been suggested by Getzels,[1] as well as by Vidler (1977).

The Questions to be Addressed

The questions to be addressed were considered in the following hypotheses:

THEORETICAL HYPOTHESIS 1: Modeling affects exploratory behavior.

Research Hypothesis 1: Groups exposed to a "high curious" model (M_{HC}) will exhibit more exploratory behaviors than groups exposed to a "low curious" model (M_{LC}).

Statistical Hypothesis 1: $M_{HC} > M_{LC}$

Research Hypothesis 2: Groups exposed to a "high curious" model will exhibit more exploratory behaviors than groups exposed to no model at all (M_{CON}).

Statistical Hypothesis 2: $M_{HC} > M_{CON}$

Research Hypothesis 3: Groups exposed to a model who exhibits high positive affect (M_{HA}) will exhibit more exploratory behaviors than subjects who are exposed to the low affect model (M_{LA}).

Statistical Hypothesis 3: $M_{HA} > M_{LA}$

Research Hypothesis 4: Groups exposed to a model who exhibits high positive affect will exhibit more exploratory behaviors than groups exposed to no model at all.

Statistical Hypothesis 4: $M_{HA} > M_{CON}$

Research Hypothesis 5: Groups exposed to a low curious model will exhibit less exploratory behaviors than the control group.

[1]Remarks made by Jacob Getzels during a symposium on problem finding at the 87th annual convention of the American Psychological Association, New York City, September, 1979.

Statistical Hypothesis 5: $M_{LC} < M_{CON}$

Research Hypothesis 6: Groups exposed to a model who exhibits low affect will exhibit fewer exploratory behaviors than the control group.

Statistical Hypothesis 6: $M_{LA} < M_{CON}$

THEORETICAL HYPOTHESIS 2: High curious children will exhibit more exploratory behaviors in the experimental setting than low curious children.

Research Hypothesis 7: Children rated high in classroom curiosity by their teachers (R_{HC}) may exhibit more exploratory behaviors than children rated low in classroom curiosity (R_{LC}).

Statistical Hypothesis 7: $R_{HC} > R_{LC}$

Research Hypothesis 8: Children who are high epistemic curious as indicated by their scores on the post experimental questionnaire (Q_{HC}) will exhibit more exploratory behaviors than children who are low epistemic curious (Q_{LC}).

Statistical Hypothesis 8: $Q_{HC} > Q_{LC}$

Modeling Films

A ferris wheel 10 inches in diameter constructed from an erector set and an electric motor was used in the modeling films. Attached to the ferris wheel were (1) a remote control switch allowing the user to control for on, off, forward, and reverse, (2) a bogus electrical control panel with nine switches, with one red and one green light above each switch, (3) one "emergency" buzzer, which did not buzz, (4) a set of controls, not visibly attached to the ferris wheel, which allowed the experimenter to disconnect the model's controls and electrical power supply, and then vary the activities of the ferris wheel off camera. The lights on the bogus control board were wired to flash on and off in a random pattern. The switches under each pair of lights were wired to disconnect the circuit for that set of lights only. The various electrical parts on the apparatus were labelled with various terms not ordinarily in the vocabulary of the average second-grade child (e.g., ohms, volts, amps, watts, ergs), as well as some familiar terms (e.g., fast, slow, fuel). The purpose of the bogus panel was to provide complexity and novelty to the situation, and to allow for a more extensive exploratory strategy on the part of the model and the subject.

Five types of films were created: four curiosity films and a control group film. In the four experimental conditions, an eight-year-old female model, playing with a ferris wheel, was presented on film. After one minute of playing time, the ferris wheel began to malfunction. At first, the ferris wheel stopped. It was manipulated with hidden controls so that it moved backward and forward in short, jerky movements. The model tried to regain control of the apparatus with her own control box, but it was clear that the apparatus was malfunctioning and that there was nothing she could do to regain control.

A Polarvision instant movie camera and projector were used. Films were three minutes long. The audio portion was a voice-over recorded by the experimenter on a cassette tape recorder.

The model's reactions to the films varied according to the following experimental conditions:

1) High curiosity-High affect (HH) film: The model played with the apparatus for two minutes. When it began to malfunction, she began to explore in a systematic manner: (a) the control box, (b) the seats on the ferris wheel, (c) the connections between the seats and the main part, (d) the main part of the ferris wheel, and

(e) all the switches on the bogus control board. The model then repeated the procedure. Throughout her exploratory activities, the model appeared amused and self-confident. Her speech, actions, and expressions indicated that she was enjoying the search. Sample remarks were: "I sure would like to figure this out...I just can't get it to work. This is really interesting...Now it's really broken... I just don't understand it...This is a really nice toy...I like trying to figure things out..." The film ended with the model still exploring, still enjoying the search (Verbatim transcriptions are presented in Appendix B).

2) High curiosity-Low affect (HL) film: The model explored as in (1) above. However, she was inexpressive. She appeared to be finding the search neither pleasant nor unpleasant. Her remarks merely described her actions (e.g., "Now it's really broken. I think I'll try to see what went wrong. No, it's not working..."

3) Low curiosity-High positive affect (LH) film: The model explored very briefly. She looked around the apparatus without touching it. She also tried to control the switch. Her remarks were positive and expressive as in the HH condition described in (1) above.

4) Low curiosity-Low affect (LL) film: The model explored as in condition (3) above. Her demeanor and remarks were as in condition (2) above.

5) Control group (C) film: The control group viewed a film of the same model reading the story Marvin K. Mooney, Won't You Please Go Now, by Dr. Seuss.

Subjects

Forty boys and forty girls from second-grade classrooms in Morristown, New Jersey, were randomly drawn and assigned to four experimental conditions and one control condition. Total enrollment in the six second-grade classrooms was 126. The mean age of the children was 97.8 months, with a range of 91 to 116 months and a median and a mode of 99. Parent permission forms were obtained for 94 children to participate. Of these, 14 children, randomly selected, were used for a brief pilot study for the purpose of testing, refining, and standardizing the procedures. None of the children refused to participate. The school enrollment represented a cross-section of socio-economic and ethnic groups, with the majority representing the white middle-class. Fourteen children involved in the study were Black, three were Oriental. These children were randomly assigned to the five conditions.

Experimental Task

A second task similar to the task portrayed in the modeling films was used to study the children's vicarious learning. A Tyco electric train set with a 68 inch oblong track was substituted for the ferris wheel. The engine and two cars were used. Attached by insulated electrical wire to the track was (1) a bogus board identical to the bogus board in the modeling films, (2) a control box with two toggle switches, one labelled "on-off," and one labelled "forward-reverse," and (3) a second control box with a toggle switch labelled "direction-forward-reverse," and a continuous switch labelled "speed-stop-full." A third switch was connected to this control box by wire, which allowed the experimenter to turn off the subjects' controls. The second control box was wired together with the cord leading to the power source. The cords leading from the electrical outlet to the experimenter's desk were hidden behind some bookcases and the experimenter's desk. The control box was taped behind the desk so that it was accessible to the experimenter, but not in view.

Observation Instrument

An observation form was developed for this study in order to assess types of exploratory behavior as well as time on task. (See Appendix C). This instrument allowed for coding of both objects explored and types of exploratory behavior for five-second intervals. For each interval, it was possible to tally two marks, one for object explored, and one for type of exploratory behavior. Objects explored included: Track, Cars (of the train), Board (bogus control board), Control Box (subject's control box for the train), and Switches (either on the control board or control box) indicated by a second tally in the same interval. Types of behavior included: Touching (hands on the apparatus), Shaking (picking up the apparatus and visibly moving it back and forth in a rapid motion), Taking Apart (dislocating and/or separating any part or part of the apparatus), Turning (picking up part or parts of the apparatus and turning at least a 90° turn), Looking (peering intently at part or parts of the apparatus), No Action, and Other, which could represent either a different activity or object explored. Most activities coded in "Other" were in the category of question asking, while the predominant "Other" objects explored were the wires attached to the tracks and the bogus board.

Inter-observer reliabilities were obtained on 17.5% of the sample while the study was in progress. A female teacher in her late thirties was trained by the experimenter in the coding procedure. Practice sessions took place in the home of the experimenter. During the observation period, the second observer sat to the right of the experimenter and pretended to mark papers. A second earphone was attached to the cassette recorder for use by the second observer. Reliability was calculated by obtaining a ratio of categories agreed upon to total categories tallied. There was a 91% inter-observer reliability for objects, and 85% for types of activities.

Teachers' Rating Forms For Students' Curiosity

Immediately following the completion of all experimental treatments in both schools, teachers were asked to complete general curiosity rating scales for each subject (See Appendix A). Items were adapted from curiosity surveys developed by Maw and Maw (1964), but were stated in behavioral rather than descriptive terms (e.g., Does... explore and/or manipulate strange things in the classroom? Does (s)he seek out new experiences?). The rating scale allowed for a total score of from 1 to 9. A Kuder-Richardson formula 20 (Anastasi, 1968) was obtained (r = .90) in order to assess internal reliability of the instrument. In order to obtain inter-rater reliability coefficients for the teachers' rating scales, it was necessary to obtain scores from a different population than the one in the present study, since two teachers were needed to rate the same group of children. Two third-grade teachers, sixth-grade teachers, and seventh-grade teachers in a nearby afternoon Hebrew School were asked to complete the rating scale used in this study. In each grade, both teachers were responsible for teaching the same group of children. One teacher taught history and culture, the other taught Hebrew reading and language. The third-grade class consisted of 20 children, with a mean age of 107.6 months. The sixth- and seventh-grade classes consisted of 7 children and 10 children, with mean ages of 140.4 months and 148.2 months respectively. A correlation of .44 was obtained between the two teachers in each grade level for total scores on the teacher rating instrument. Agreement between the teachers on individual items was 58%.

Assessment of Subjects' Intelligence

The Houghton Mifflin Cognitive Abilities Test, Form 3, had been administered to the students by the school prior to the study.

Procedure

Subjects were individually led to the experimental room by the experimenter. They were told that they were going to see a movie and play with electric trains, and would then be asked to give their opinions about some toys (See Appendix D). The subjects were shown one of the five modeling films. At the completion of the film, the children were invited to play with the electric trains and were shown how to run them, using the subjects' control box. The experimenter asked the subject if he or she would like to play with the trains for awhile, while the experimenter "graded some papers." All subjects indicated that they would like to play with the trains. The experimenter sat at the desk, "grading papers," with her back toward the child. The experimenter was seated in such a way that the subject and apparatus could be seen, but the subject was unaware that he or she was being observed. Time intervals were signalled by a cassette tape. The experimenter used an earphone so that subjects would be unaware of the intervals. If a subject questionned the use of the earphone or cassette recorder, the experimenter responded that she was "listening to the answers" to the questions on the papers she was marking. In actuality, the papers were the observation instruments for the experimental session.

The subject was allowed to play with the trains for 30 seconds, after which the experimenter disconnected the subject's controls, causing the train to stop. The observation period lasted for ten minutes, during which the experimenter tallied both types of objects explored and types of exploratory behaviors.

Subjects' exploratory behaviors were rated according to the following criteria:

1) Time on task
2) Active exploratory behaviors (e.g., switches, touching, shaking, taking apart, turning)
3) Passive exploratory behaviors (e.g., touching-no action, looking)
4) Number of objects explored (e.g., tracks, cars, board, control box)
5) Number of types of actions
6) Bogus board exploration (i.e., whether or not bogus control board was actively or passively explored)

The above measures were tallied and coded by the experimenter during the experimental sessions. Subjects' internal states of epistemic curiosity were inferred based on their responses to the post-experimental questionnaire.

At the end of the ten minute observation period, or after three minutes of no activity on the part of the subject, the experimenter walked over to the subject and paused, allowing for any spontaneous questioning on the part of the subject. After ten seconds, the experimenter questioned the children as follows:

1) Did anything happen?
2) Was it surprising?
3) Did the train break? (To be omitted if already noted by the subject)
4) Did you try to find out why the train broke?
5) What did you try?
6) Why do you think the train broke?
7) (In an informal manner) You can go back to your classroom now. I have to try to fix the trains for the next person. (This gave the subject an opportunity to ask the experimenter how she planned to fix the apparatus.)

The children's answers were recorded by the experimenter. Each response or hypothesis formulated was given one point.

CHAPTER IV

RESULTS

Multivariate Analyses

In order to obtain a general summary of modeling effects, a 2 X 2 X 2 multivariate analysis of variance model (MANOVA) was used to assess the effects of model curiosity, model affect, and sex of the child upon the response vector composed of curiosity and exploratory behavior measures (Keppel, 1973). The dependent measure means are presented in Table 1. Model curiosity significantly increased children's curiosity in general[1], $F_{MULT}(7,50) = 6.57$, $p < .001$. Univariate F tests presented in Table 2 revealed that model curiosity significantly affected all possible classes of observed exploratory behaviors. It will be noted by looking at Table 1 that the children exposed to the high curious model showed significantly more of all types of exploratory behavior in all cases than children exposed to the low curious model. Epistemic curiosity was increased by high model curiosity but this effect did not reach significance. Epistemic curiosity measures assessed subjects' interest in finding out the causes of malfunction of the apparatus, as well as specific hypotheses advanced by the subject for the causes of the malfunction.

The sex of the child was significantly related to the children's curiosity in general, $F_{MULT}(7,59) = 3.53$, $p < .004$. Univariate F tests results in Table 2 have indicated that the boys ($M = 51.29$) showed significantly higher levels of active exploration than the girls ($M = 29.19$). The sex of the child was significantly related to

[1]All multivariate tests of significance are based on the Wilk's lambda criterion.

TABLE 1

Dependent Measure Means by Treatment Variations

	Model's Behavior									
	High curiosity				Low Curiosity				Control	
	high affect		low affect		high affect		low affect			
Dependent Measure	M	SD	M	SD	M	SD	M	SD	M	SD
Task frequency	67.26	36.66	70.63	38.84	27.62	21.85	28.31	25.48	36.56	35.18
Active behaviors	54.73	41.54	60.12	38.84	22.25	19.95	28.68	22.09	33.00	32.04
Passive behaviors	12.93	8.68	16.50	24.13	5.37	6.73	5.87	8.32	3.57	3.28
No. objects physically explored	3.25	1.65	3.06	1.44	1.81	1.11	1.93	0.99	2.25	1.13
No. objects visually explored	2.18	1.22	1.50	0.89	0.93	0.77	0.68	0.70	0.62	0.62
No. actions	2.68	1.25	2.56	1.41	1.93	0.77	1.75	1.06	2.12	1.02
Questionnaire score	3.75	2.02	3.50	2.50	2.43	2.22	3.18	1.68	3.37	2.50

TABLE 2

Univariate *F* Tests for Each Dependent Measure

(2 X 2 X 2 MANOVA, Curiosity X Affect X Sex)

	Effect					
	Model Curiosity		Sex		Sex X Curiosity	
Dependent Measure	*F*	*p*	*F*	*p*	*F*	*p*
Active behaviors	19.20	.0001	7.86	.007	1.24	*ns*
Passive behaviors	5.71	.03	3.48	.07	.89	*ns*
No. objects physically explored	15.18	.0003	3.98	.06	.44	*ns*
No. objects visually explored	21.00	.0001	3.26	.08	1.56	*ns*
Bogus control board	18.98	.0001	2.11	*ns*	.08	*ns*
No. actions	7.14	.01	.56	*ns*	.56	*ns*
Questionnaire score	2.48	*ns*	6.48	.02	.72	*ns*

Note. *df* = 1/56

epistemic curiosity (post-experimental questionnaire). The boys ($\underline{M}$ = 3.88) exhibited higher levels of expressed curiosity than the girls ($\underline{M}$ = 2.56). Dependent measure means by treatment variations by sex are presented in Table 3.

The child sex by model curiosity interaction effect was significant $\underline{F}_{MULT}(7,50) = 2.63$, $\underline{p} < .03$. Univariate $\underline{F}$ tests of each dependent measure revealed no separate child sex by model curiosity interactions of significance. There was no significant main effect for model affect $\underline{F}_{MULT}(7,50) = 0.50$, n.s.

In addition to this general summary of modeling effects, a number of specific questions were also of interest. One important question was the performance of children in the high curious modeling and low curious modeling groups relative to that of the control group. To examine these questions, a 2 X 5 MANOVA was used to examine the differential performance of the five individual treatment groups (i.e., high curiosity-high affect, high curiosity-low affect, low curiosity-high affect, low curiosity-low affect) relative to the control group. The sex of the child was included in this analysis since it proved significant in the initial summary analysis. There was a main effect for treatment groups, $\underline{F}_{MULT}(7,64) = 2.02$, $\underline{p} < .003$, and a main effect for child sex $\underline{F}_{MULT}(7,64) = 3.91$, $\underline{p} < .002$. The means for the control group and experimental group are presented in Table 1. The interaction between sex and experimental groups was not significant by multivariate test. Univariate $\underline{F}$ tests for each dependent measure of the control group comparisons have been presented in Table 4. The means for the boys' and girls' performance on each dependent measure are presented in Table 3.

TABLE 3

Dependent Measure Means by Treatment Variations by Sex

	Curiosity					
	Boys			Girls		
Dependent Measure	High	Low	Combined	High	Low	Combined
Active behaviors	72.94	29.63	51.29	42.07	16.32	29.19
Passive behaviors	20.07	7.38	13.73	9.38	3.87	6.63
No. objects physically explored	3.38	2.32	2.85	2.94	1.44	2.19
No. objects visually explored	2.19	.88	1.53	1.51	.74	1.13
No. actions	2.63	2.07	2.35	2.63	2.94	2.78
Questionnaire score	4.51	3.25	3.88	2.75	2.37	2.56

TABLE 4

Univariate F Tests for Each Dependent Measure

(2 X 5 MANOVA, Sex X Treatment Groups)

Dependent Measure	Effect					
	Sex			Treatment Group		
	df	F	p	df	F	p
Active behaviors	9/70	6.20	.02	9/70	4.79	.002
Passive behaviors	9/70	4.77	.04	9/70	2.64	.05
No. objects physically explored	9/70	4.00	.05	9/70	4.17	.005
No. objects visually explored	9/70	3.87	.06	9/70	9.50	.0001
No. actions	9/70	0.09	ns	9/70	1.98	ns
Questionnaire score	9/70	7.90	.007	9/70	0.86	ns

In order to carry out hypothesized comparisons between groups, *a priori* *t*-tests (Kirk, 1968) were used. Results are presented in Table 5. Most significant comparisons were found when comparing the high curious groups with the low curious groups and with the control group. Significant comparisons were found for active behaviors, passive behaviors, number of objects physically explored, and number of objects visually explored. The number of actions variable approached significance. Highly significant comparisons were also found when comparing the control and high curiosity groups (passive behaviors, number of objects physically explored, number of objects visually explored). Comparisons of control to high and low affect groups yielded fewer significant comparisons (see Table 5).

Chi-square comparisons were computed for the exploration of the bogus board dependent measure. Exploration of the board was coded dichotomously (yes or no). The test results are presented in Table 6. Again, comparisons between high curious and low curious groups and between high curious and control groups were significant, with the high curious groups exhibiting more exploratory behaviors with the bogus control board than either the low curious groups or the control group.

The role of intelligence in the children's responsiveness to modeling treatments was examined in a separate analysis. A 3 X 2 X 2 MANOVA was used to assess the effects of intelligence, model curiosity, and model affect on exploratory behavior. Intelligence scores were divided into three levels: low (range = 64-101, *M* = 88.36), medium (range = 102-114, *M* = 104.19), and high (range = 114-141, *M* = 121.72). This analysis revealed no main effect

TABLE 5

t-Tests of Comparisons Between Means

Dependent Measures	HH+HL vs. LH+LL[1]	Control vs. HH HL[2]	Control vs. HH+LH[2]	Control vs. HL+LL[2]	Control vs. LH+LL[2]
	Comparisons				
Active behaviors	4.28**	-2.48**	ns	2.48	ns
Passive behaviors	2.65**	-3.41**	ns	ns	ns
No. objects physically explored	3.99**	-7.32**	-2.28**	-2.44*	-3.05**
No. objects visually explored	3.95**	-4.67	-3.59**	ns	ns
No. actions	2.34*	ns	ns	ns	ns
Questionnaire score	ns	ns	ns	ns	ns

Note. HH = High curiosity-High affect; HL = High curiosity-Low affect; LH = Low curiosity-High affect; LL = Low curiosity-Low affect.

[1] *df* = 63. [2] *df* = 43

* *p* .05. ** *p* .01.

TABLE 6

Comparisons Between Groups' Exploration of Bogus Board

Comparisons	X^2
HH + HL *vs.* LH + LL	14.769**
Control *vs.* HH + HL	8.521***
Control *vs.* HH + LH	*ns*
Control *vs.* HL + LL	*ns*
Control *vs.* LH + LL	*ns*

Note. HH = High curiosity-High affect; HL = High curiosity-Low affect; LH = Low curiosity-High affect; LL = Low curiosity, Low affect.
** p .004. *** p .0001

for children's intelligence $\underline{F}_{MULT}(14,92) = 0.54$, n.s., nor were there interactions with modeling treatments $\underline{F}_{MULT}(7,46) = 0.48$, n.s.

Teacher ratings of children's curiosity and exploratory behaviors in the classroom were subjected to a one-way analysis of variance on each dependent measure. No overall effect was found for any of the four experimental groups combined $\underline{F}(49,258) = 1.11$, n.s., or the control group $\underline{F}(35,19) = 1.51$, n.s. Multiple regression analyses on which the effects of teachers' ratings were correlated with the five experimental dependent variables also yielded insignificant results $\underline{F}(10) = 1.56$, n.s. Apparently the teacher ratings of the children's curiosity were not predictive of the children's exploratory behavior in an experimental setting.

Supplementary Analyses

During the course of the study it became apparent that the children's responsiveness to the modeling treatment appeared to vary as a function of their enrollment in one of the two schools that were involved. In order to assess these effects, a separate analysis was undertaken. This analysis involved a 2 X 5 MANOVA model, with school of enrollment serving as one variable and the children's exposure to the four modeling treatments or the control group constituting the other variable. The overall school effect was found to be very highly significant $\underline{F}_{MULT}(7,64) = 7.84$, $\underline{p} < .0001$. Children in school #1 scored significantly higher than children in school #2. Univariate $\underline{F}$ tests for the children in school #1 and school #2 for each dependent measure are presented in Table 7. Perusal of Table 7 reveals that the children in the schools differed significantly on the dependent measures of active exploration,

TABLE 7

Univariate F Tests for Each Dependent Measure

(2 X 5 MANOVA, School by Treatment Groups)

	Effect			
	School		Treatment Group	
Dependent Measure	F	p	F	p
Active behaviors	19.44	.0001	6.87	.0001
Passive behaviors	2.21	ns	1.55	ns
No. objects physically explored	14.05	.0004	5.61	.0006
No. objects visually explored	.48	ns	8.14	.0001
No. actions	17.33	.0001	3.19	.02
Questionnaire score	19.06	.0001	1.50	ns

Note. *df* = 9/70

physical exploration, number of actions, and the epistemic curiosity score. The means for the two school groups are presented in Table 8. It can be seen that the children in school #1 scored significantly higher than the children in school #2 on all the exploratory and curiosity measures. Teacher rating scores did not differ significantly between school #1 (_M_ = 6) and school #2 (_M_ = 5.98). The implications of these findings in terms of the school environment will be discussed in a later section.

The school by experimental group interaction did not attain significance. This implies that the responsiveness to the specific treatments in the study was not affected individually by the school in which the child was enrolled.

It also became apparent during the course of the study that there might have been a relationship between teachers' perceptions of children's curiosity and total score on the epistemic curiosity scale, as well as the other observed measures. Results of correlation coefficients between the post-experimental questionnaire and each dependent measure are presented in Table 9. There were significant correlations between total epistemic curiosity score and teachers' perceptions of curiosity, active exploratory behaviors, physical exploration of objects and number of actions. Total epistemic curiosity score did not correlate with passive exploration of objects, visual exploration of objects, or exploration of bogus control board. In addition, a correlation of .49 ($p < .0001$) was found between teachers' perceptions of children's curiosity and their IQs. The correlation between total epistemic curiosity score and IQ was not significant ($r = -.06$).

TABLE 8

Dependent Measure Means by Treatment Variations by Schools

	Schools	
Dependent Measure	#1	#2
Active behaviors	55.05	25.46
Passive behaviors	5.76	10.44
No. objects physically explored	2.55	1.99
No. objects visually explored	1.10	1.23
No. actions	2.83	1.76
Questionnaire score	4.36	2.37
Teacher rating scale	6.00	5.97

TABLE 9

Correlation Coefficients for Each Dependent Measure for Entire Sample

Dependent Measure	Teachers' ratings	Active behaviors	Passive behaviors	Physical Expl.	Visual Expl.	Bogus Board	Questionnaire
Teachers' Ratings	--	.14	.19	.17	.20	-.12	.34
Active behaviors	.14	--	.33	.78	.36	-.47	.47
Passive behaviors	.19	.33	--	.28	.37	-.37	.12
Physical exploration	.17	.79	.28	--	.52	-.55	.43
Visual exploration	.20	.36	.37	.52	--	.58	.12
Bogus board	-.20	-.47	-.37	-.56	-.58	--	-.21
Questionnaire	.34	.47	.12	.43	.12	-.21	--

Summary of Results Bearing on the Hypotheses

A number of specific hypotheses were advanced to guide this study. At this point, each hypothesis and the findings will be reconsidered.

The Effects of Modeling on Exploratory Behavior (Hypotheses 1-6). There is a great deal of evidence to support the hypothesis that exposure to a highly curious model affects a subject's subsequent behavior. The findings presented in Table 2 revealed highly significant univariate *F* statistics for curiosity and exploratory behaviors on six of the seven dependent measures. The *t*-tests of comparisons and Chi-squares between groups reveal highly significant results when comparing high curious modeling to low curious modeling and control groups (Tables 5 and 6). There was no evidence to support the notions that model affect influenced a subject's subsequent exploratory behavior, or that exposure to a low curious model inhibits exploratory behavior.

Interaction of Teachers' Ratings of Curiosity With Modeling Treatment (Hypothesis 8). No overall multivariate effect was found when teacher ratings of children's exploratory behaviors were subjected to a one-way analysis of variance. Children's reactivity to the modeling treatments was apparently not related to teacher ratings of curiosity and exploratory behaviors. However, there was a significant correlation between scores on the post-experimental epistemic curiosity questionnaire and teachers' ratings of trait curiosity (Table 9).

Interaction of Epistemic Curiosity Scores With Modeling Treatment (Hypothesis 8). The children's expressed curiosity as inferred from the total score on the post-experimental questionnaire, and the children's actual exploratory response to the same situation were correlated separately for the four experimental groups and one control group. The correlations are presented in Table 9. Significant correlations were found between epistemic curiosity and the following three measures: active exploration, number of objects physically explored, and number of types of actions. Passive exploration, number of objects visually explored, and exploration of the bogus control board were not correlated significantly with the total questionnaire scores.

Effects of Children's Intelligence on Modeling Treatment. A 3 X 2 X 2 MANOVA was used to assess the effect of intelligence, model curiosity, and model affect on children's exploratory behavior. There was no significant main effect for children's intelligence $F_{MULT}(14,92) = 0.54$, n.s., nor were there interaction effects with modeling treatments $F_{MULT}(7,46) = 0.48$, n.s.

CHAPTER V

DISCUSSION

The results of this study indicate that: (a) curiosity and exploratory behaviors were learned and/or facilitated through modeling, (b) children's verbally expressed curiosity was not affected by modeling treatment, (c) teachers' ratings of curiosity were not predictive of exploratory behaviors in an experimental setting but predicted expressed curiosity about the same setting, (d) the sex of the child was a significant factor in specific types of exploratory behavior, and (e) the social climate of the school may have been an important factor in exploratory behavior. The above findings will be discussed in relation to the experimental paradigm, arousal theory, social learning theory, trait-state conceptions of personality, problem finding theory, and educational practice.

Model Curiosity

A major focus of this study was to determine whether curiosity and exploratory behaviors can be learned or facilitated through modeling. In general, children exposed to the high curiosity modeling treatments increased their exploratory behaviors. However, children's exploratory behaviors were not significantly inhibited by the low curiosity modeling treatments. Low curiosity models did not depress exploratory behavior. This is not an unusual finding in the social learning literature (e.g., Zimmerman & Ringle, 1981). Inhibition effects most consistently occur when a model receives punishing outcomes (Zimmerman & Kinsler, 1979). Inhibitions can also occur when expected standards of performance are unknown to a child. Curiosity tasks could be such a situation, but in this study inhibition effects did not occur. The task was essentially attractive and nonthreatening to the children. The different effects of the high curious versus the low curious models suggest that children did not blindly imitate models, but that they selectively emulated models when their performances were deemed relevant.

It might be argued that the modeling condition served as a disinhibiting rather than a learning situation. The distinction between these two effects depends on prior response levels and prior experience. No evidence is available about these prior conditions. However, disinhibition is often thought to be situation-specific, while rule learning involves transfer. In this study, some degree of transfer was involved. Both the experimental stimulus and setting differed from the modeling film stimulus and setting (the experimental task took place in the classroom, while the modeling film was filmed outdoors on a lawn). The transfer effects across tasks and situations present some evidence that exploratory skills were acquired rather than simply indicating disinhibition.

In addition, the question may be raised that the results might reflect a general raise in activity level ("diversive exploration") rather than purposive problem finding activities ("specific exploration"). No measures were collected on nonmodeled behaviors, and all classes of response were significantly affected by the modeled curiosity. However, the size of the modeling affects varied considerably across the dependent measures. This indicates selectivity in the children's response to the modeling treatment. If the facilitation effects instigated by observing the model were general, comparable treatment effects would be expected across dependent measures. The results presented in Table 2 indicate this was not the case.

Model Affect

No significant differences were found between groups exposed to a high affect model versus groups exposed to a low affect model, or to the control group. It is possible that the task context was of such a nature that the model's affective cues were not relevant. The high affect model was presented as enjoying the search, but not actually solving the problem. This might have seemed artificial to some subjects. In addition, it is possible that second-grade children were not able to discriminate and/or process the model affect cues presented in the films.

This study did not support the notion that model affect had an impact on children's exploratory behavior. However, it is possible that future studies with different tasks and/or different age groups might yield different results.

Is Curiosity a Unitary Concept?

The second outcome was that verbally expressed curiosity was not affected by modeling treatment, and that the first six dependent measures (i.e., active exploration, passive exploration, number of objects physically explored, number of objects visually explored, total number of actions, and exploration of the bogus control board) were not correlated with each other unless the behaviors in question were modeled. Subjects in the high curiosity experimental groups were influenced by the model's behavior across all dependent measures. Examination of Tables 5 and 6 reveals that groups exposed to a high curious model were significantly influenced by the model's behavior on 6 of the 7 dependent measures when compared to groups exposed to a low curious model or to no model at all. The dependent measure not significantly affected by modeling treatments was the epistemic curiosity questionnaire score. Epistemic curiosity behaviors were not specifically modeled.

A significant correlation was found between the epistemic curiosity score and three of the six dependent variable measures (active exploration, number of objects physically explored, and number of actions). There were no significant correlations between epistemic curiosity score and passive exploration, number of objects visually explored, and exploration of the bogus control board. These findings suggest that certain types of exploratory activities were more related to the internal state than others. It is clear that more than one curiosity factor is required to explain this lack of intercorrelation. Langevin (1971) and Kreitler _et al_. (1975) have also concluded that curiosity does not seem to be a manifestation of a single underlying construct. This notion will be addressed further in the following section.

Teachers' Ratings of Curiosity and Trait-State Assumptions

The findings indicate that teachers' ratings of children's curiosity are not predictive of their exploratory behavior in an experimental setting, but they did predict _expressed_ curiosity about the same setting, as indicated by scores on the post-experimental epistemic curiosity questionnaire.

There was no overall MANOVA main effect for general curiosity or for teachers' ratings of the children's exploratory behaviors in any of the four experimental groups or the control group. However, in a separate analysis, there was a low but significant correlation ($\underline{r}$ = .31, $p > .01$) between teacher ratings of curiosity and children's answers on the post-experimental questionnaire. A possible explanation for this finding is the nature of the classroom situation from which the teachers form their judgments. In the classroom, teachers typically focus on verbal rather than physical behaviors. The type of curiosity and exploratory behaviors that teachers are most likely to notice may therefore be verbal in nature. The correlation of the teacher rating scale with the only verbal/interactive dependent measure could be expected. In addition, there was a high positive correlation between teacher ratings of children's curiosity and intelligence test outcome for children. This finding has occurred in previous studies of curiosity in children (e.g., Maw & Magoon, 1971; Coie, 1974). It is well known that the $\underline{g}$ factor of intelligence tests is best predicted by tests of verbal facility. It is therefore suggested that teachers tend to judge children's curiosity according to their verbal performance in the classroom (e.g., Coie, 1974; Minuchin, 1971). In this study, significant correlations were found between verbally expressed children's curiosity, active exploration, and number of objects physically explored.

These findings suggest support for the notion that behavioral repertoires can be acquired through modeling, and that children incorporate into their behavioral repertoires observed behaviors of others. Exploratory behaviors, in this sense, represent a group of responses which may be transmitted through modeling. But degree of imitation of the exploratory responses varied. This differentiated adoption of modeled responses supports a skill acquisition description of exploratory behavior rather than a trait concept of curiosity. It is also interesting to note that children's verbal responsiveness to questions (epistemic curiosity) was not significantly affected by their experimental treatment group. Such verbal responses were not expressly modeled. Together these outcomes indicate considerable selectivity in children's adoption of modeled exploratory responses.

The weakness of the trait-state model is that it does not account for the impact of experience on personality development. Traits are descriptions of people, made by themselves or others. On the basis of these characteristics, predictions were made about observable behavior (Mischel, 1979). According to Mischel (1979), the fundamental attribution error of trait theorists is that they underestimate the importance of situational determinants, while overestimating the degree to which an individual's general characteristics affects behavior. This study supported the notion that situational determinants are important factors affecting human behavior.

Epstein (1979, 1980) argued that it is possible to demonstrate high correlations between rating scales and objective behavior if researchers aggregate behavioral measures across situations and occurrences. Aggregation both reduces errors of measurement and broadens the range of generalization. The present study did not allow for such aggregation in its design, since only one experimental situation was created. Thus the nonsignificant findings between rating scales and objective behavior may be due to limited sampling of situations rather than the invalidity of teacher judgments.

The teacher rating scale. The purpose of the teacher rating scale was to explore whether teachers' descriptions of children's general curiosity could predict their behavior in an experimental setting. The scale was accepted as a summary measure of a teacher's judgments about her pupils. The findings of this study indicated that total epistemic curiosity score was the only dependent measure to significantly correlate with teachers' ratings (Table 9). This implies that teachers rated their students on verbally expressed curiosity rather than on its other dimensions. It is clear that the teacher ratings were not predictive of the types of exploratory behaviors observed in the experimental situation. Teachers basically emphasize verbal behaviors (oral or written) of children in their classrooms. The exploratory behaviors observed in this study and in curiosity research in general were nonverbal. Overall, epistemic curiosity was not found to be significantly influenced by modeling *per se*, but the results tended to reveal tendencies in the hypothesized direction. The notion that epistemic curiosity can be affected by treatment merits examination in future research, perhaps with older subjects who might either be more aware of the cognitive implications of model exploration, or more capable of a more sophisticated form of verbal expression.

Sex of the Child

The sex of the child was found to be significantly related to curiosity and exploratory behaviors. The most obvious explanation for this sex effect involves the stimulus materials. It is possible that electric trains are still considered a "male" toy, and that while the girls seemed just as eager to play with them as the boys were, they might have been more hesitant to have had contact with the toy, or they just might have lost interest or given up sooner. The notion of societally sanctioned "male" and "female" toys and children's resulting differential abilities to deal with the different types of problems they represent merits further investigation.

School Effects

The significant effects found between schools point to the possible contribution of the environment of the school on curiosity. Overall, children in school #1 were more highly curious and engaged in more active exploratory behaviors than children in school #2. There were no significant differences in passive exploration, or number of objects visually explored. A more detailed investigation of the different school environments would be necessary in order to attempt an examination of the etiology of the differences in behavior. Possible explanations might be differences in discipline and/or teacher behaviors between the schools. Active exploration and question-asking seemed to have been more inhibited in school #2. Another explanation might be the physical environments of the two schools. The two schools were structurally dissimilar. School #1 was more modern than school #2, and was built in a circular design, with a learning resource center in the center of the building. School #2 did not have a prominent learning resource center or library equally accessible to all the classrooms in the building. It should be pointed out that both schools were approximately equal in distribution of children with regard to socio-economic status. The Morris School district utilizes busing of children to achieve total racial and socio-economic integration. Further, the two schools were located in the same general area of Morristown. It is therefore reasonable to assume that factors within the school environment affected children's exploratory behavior in the experimental setting. This issue should be investigated in future research.

CHAPTER VI

CONCLUSIONS

The results of the present study, along with other findings (e.g., Zimmerman & Pike, 1972; Saxe & Stollack, 1971; Johns & Endsley, (1977) indicate that modeling can influence exploratory behavior. Also important is the experience the child brings with him or her to the experimental situation, such as differential backgrounds due to their sex or type of home. The effect of the social environment was clearly shown to be an important factor in the development of curiosity skills of problem finding and exploration. It is therefore necessary to reconceptualize the nature and etiology of classes of behavior. These findings indicate that Berlyne's "arousal drive" may not be a sufficient explanation for the emergence and development of exploratory behaviors. The argument that people are equipped with inborn responses to environmental stimuli does not provide an adequate explanation for the etiology of the more complex types of exploratory behaviors, nor for between and within person variations in behavior that have been found to occur. The present study has provided support for the notion that there is a social learning/experiential component in the acquisition of exploratory behaviors and skills in young children.

The Role of Experience versus Trait Notions of Curiosity

This study indicated the importance of the role of social experience in the development of curiosity and exploratory behaviors. It sought to identify and clarify experiential causes of within and between person variations in curiosity. Curiosity has previously been conceptualized as either a trait or as a response to specific stimuli in the environment. This study has demonstrated that exposure to a model is a better predictor of exploratory behavior in a given situation than are teachers' perceptions of children's curiosity or the nature of the stimulus itself.

Another interesting correlation to emerge was the relationship between the children's more active and physical forms of curiosity and their verbal behavior. The search for knowledge reflected in the epistemic curiosity score is related to certain actions more than others. These findings suggest a relationship between a person's knowledge needs and certain types of exploratory behaviors. The most obvious explanation for this finding is that active exploratory behavior is more indicative of a student's cognitive need to find out about things. However, it is possible that the children might have been attending only to the exploratory strategies modeled and not the verbal aspect of the modeling films.

The Relationship of Curiosity to Problem Finding

The relationship between curiosity and problem finding has been an interesting notion to study and also merits further research. Problem finding behaviors are essential to the search for knowledge. Contrary to Arlin's (1979) speculations that problem finding can occur only during puberty, it is very clear that elementary school children displayed problem finding behaviors on a task more suited to their age level. Problem finding is a necessary and important aspect of problem solving, and should logically develop before or along with the emergence of problem solving abilities. The relationships between problem finding, curiosity, and problem solving abilities needs to be further explored at all age levels.

Educational Applications

The effect of social learning has been demonstrated to be an important factor in the development of curiosity and exploratory behaviors in children. This finding has implications for educational research, particularly research in Attribute-Treatment Interactions, teacher training, and the study of the social and physical climates of the school.

ATI research. The findings of this study suggest that exposure to models is a more effective predictor of performance in a given area than are general descriptions given by teachers. This finding is related to Tobias' (1976) notion that prior achievement and not "aptitude" *per se* is a more viable variable in ATI research, and extends the notion of "prior achievement" to prior experience or prior learning opportunities. Future researchers should attempt to devise situation specific measures which would not be suspect of influencing the outcome of the study.

Teacher training. General findings in social learning research support the notion that children's learning and behavior are affected by the models to which they have been exposed. Studies specifically observing the effect of teacher modeling on students' classroom behavior (e.g., Friedman, 1973; Friedman & Bowers, 1971) have demonstrated that students imitate teachers' verbal style as a function of reinforcement, sex, and grade level. The present study supports the notion that the types of peer models children are exposed to affects their exploratory behaviors. The notion of children adopting the exploratory skills and strategies of their teachers has not yet been explored. Current teacher training practices do not include and/or emphasize modeling techniques for teachers, although there is some evidence that such techniques may prove superior to traditional teaching methods (Zimmerman & Kleefeld, 1977). The effect of teacher behavior on children's subsequent exploratory behavior merits further investigation.

School environment. A curious and unexpected result of this study was the difference in students' performance between schools. The effect of the social and physical climate of the school on children's curiosity is a subject that has not been explored to date, and also merits further investigation.

Summary

The purpose of this study was to experimentally examine the effects of a model's problem finding behaviors and affect on children's exploratory behaviors. Results of the study revealed a clear tendency for children to imitate highly curious models. Affect of the model appeared to have no effect on children's subsequent behaviors in the experimental setting. Teachers' ratings of children's curiosity did not predict exploratory behaviors in the experimental setting, but did predict scores on a verbal post-experimental questionnaire. The sex of the child and the school attended had a significant effect on both exploratory behaviors and epistemic curiosity scores. These two unpredicted findings might indicate that exploratory behaviors are indeed socially acquired in natural as well as experimental settings. The findings of the study were discussed in relation to trait-state assumptions of curiosity, the effects of social learning on the development of exploratory behaviors, and implications for future educational research.

APPENDIX B

TEACHERS' RATING FORMS

Does ______________ explore and/or manipulate:	YES	NO
new events or things?		
strange things in the classroom?		
strange things outside the classroom?		
incongruous or mysterious things?		
incongruous or mysterious concepts?		
Does (s)he express a desire to know more about him/her self?		
Does (s)he seek out new experiences?		
Does (s)he ask many questions during lessons?		
Does (s)he seem to want to know more about things?		

APPENDIX B

MODELING FILMS

High curiosity-High affect

I really like playing with this ferris wheel. What a surprise! Something's going wrong. My control box isn't working right. I sure would like to figure this out. Now it's--no--I just can't get it to work. This is really interesting. How funny (laugh). Oh boy! Now it's really broken. First I'll look at the box, see what went wrong with the box, shake it, look at it (Gasp) This is interesting.

Now I'll look at that motor. Maybe I can fiddle around with it. Yeah, that's really interesting in there. Doesn't work. Now I'll look at the connection between the motor and the wheel. Maybe if I fiddle around with it--no--I just don't understand it. Let me see if the seats have something to do with it. This is really a nice toy. Maybe the seats aren't balanced right. It's not working again.

Maybe I'll try that big control panel over there. I'll try a switch and then I'll try the control box, and then I'll try another switch. I'll just try them one at a time and then try the control box again. This is fun. Control box, then switch, now one, and then the control box. And I'm just going to go across the board and down to figure out what went wrong. I like trying to figure things out. Those are really interesting words on the control box. I sure would like to know what they mean. I'll try the box again--no--just doesn't work. This is really funny. Let me try the box again. And let me look at the motor again. I really like doing this. And I'll keep doing it until I figure it out!

High curiosity-Low affect

I am playing with a ferris wheel. Uh oh, something's going wrong. My control box isn't working right. Now it's--no--I can't get it to work. Now it's really broken. I think I'll try to see what went wrong. No, it's not working. First I'll look at the motor. Let me take a good look. No--it's not working. Let me look at the connections between the motor and the wheel. Maybe if I fiddle around with it. No--I don't understand it. Let me see, maybe the seats have something to do with it. Maybe they're not balanced right. It's not working again. Maybe I'll try that big control board. I'll try a switch and then I'll try the box again--no--another switch, no. I think I'll just try them one at a time and then try the control box again--switch--control box, and now another one and then the control box. And I'm going across the board to figure out what went wrong. Those are very interesting words on the control box. I wonder what they mean. I'll try the box again. Now I'll look at the motor again.

Let me look at the motor again, and then I'll try the connections again and I'll just keep trying until I figure out what went wrong.

Low curiosity-High affect

I really like playing with this ferris wheel. What a surprise! Something's going wrong. My control box isn't working right. I sure would like to figure this out. Now it's--No--I can't get it to work. This is really interesting. Now it's <u>really</u> broken. It's going to be fun trying to figure this out. No--it's <u>still</u> not working (laugh). I don't understand it. Well, I'll shake the box. No--maybe the lady wouldn't like that. It just doesn't work. This is one of the most interesting toys I ever saw. I just <u>have</u> to figure out what went wrong. Well, I think I'll wait for the lady to come back. Maybe I'll take one more peek. Should I? Well, I don't think the lady would like it. I'll just wait for her to come back (laugh). What a funny toy! What an interesting problem!

<u>Low curiosity-Low affect</u>

I am playing with a ferris wheel. Uh oh, something's going wrong. My control box is not working right. Now it's--no--I can't get it to work. Now it's <u>really</u> broken. I think I'll try to see what went wrong. No--it's not working. I don't know what went wrong. I don't understand it. Well, I'll shake the box. No--maybe the lady wouldn't like that. It doesn't work anyway. I'm trying to figure out what went wrong. Well, I think I'll wait for the lady to come back. Maybe I'll look again. Should I? Well, I don't think the lady would like it if I looked again. I'll just wait for her to come back.

<u>Control Group</u>

The name of this book is <u>Marvin K. Mooney Will You Please Go Now</u>, by Dr. Seuss.

The time has come. The time has come. The time is now. Just go. GO! GO! I don't care how. You can go by foot. You can go by cow. Marvin K. Mooney will you please go now! You can go on skates. You can go on skis. You can go in a hat. But please go. Please! I don't care. You can go by bike. You can go on a Zike-bike if you like. If you like you can go in an old blue shoe. Just go, go, GO! Please do, do, DO! Marvin K. Mooney, I don't care how. Marvin K. Mooney, will you please GO NOW!

You can go on stilts. You can go by fish. You can go in a Crunk-

Car if you wish. If you wish you may go by lion's tail. Or stamp yourself and go by mail. Marvin K. Mooney! Don't you know, the time has come to go, Go, GO!

Get on your way! Please, Marvin K! You might like going in a Zumble-Zay. You can go by balloon...or broomstick. OR you can go by camel in a bureau drawer. You can go by Bumble-Boat...or jet. I don't care how you go. Just GET! Get yourself a Ga-Zoom. You can go with a...BOOM! Marvin, Marvin, Marvin! Will you leave this room! Marvin K. Mooney! I don't care how. Marvin K. Mooney! Will you please GO NOW! I said GO and GO I meant...The time has come. SO...Marvin WENT.

The End.

APPENDIX C

OBSERVATION FORM

NAME ______________________

CONDITION ______________________

SCHOOL ______________________

(Intervals)	5	10	15	20	25	30	35	40	45	50	55	60	5	10	15	20	25	30	35	40	45	50	55	60	5	10	15	20	25	30
Tracks																														
Cars																														
Board																														
Connections																														
Control box																														
Switches																														
Wheels																														
Touching																														
Smiling																														
Talking-report																														
[illegible]																														
Looking																														
Other																														
No action																														

(2½ min.)

(Intervals)	5	10	15	20	25	30	35	40	45	50	55	60	5	10	15	20	25	30	35	40	45	50	55	60	5	10	15	20	25	30
Tracks																														
Cars																														
Board																														
Connections																														
Control box																														
Switches																														
Wheels																														
Touching																														
Smiling																														
Talking-report																														
[illegible]																														
Looking																														
Other																														
No action																														

(2½ min.)

Total: 5 min.

Comments:

APPENDIX D

EXPERIMENTER'S INSTRUCTIONS TO THE SUBJECT

Hi--do you know what we're going to do today? (Pause, wait for response). I have some things I'd like you to look at--maybe you can tell me which one you'd rather get for Christmas. First, why don't you sit here and watch this movie.

(After completion of the film) I have some work to do over there. I'm going to be grading papers. Would you like to play with these trains while I grade papers?

(Following completion of post-experimental questionnaire) Which one would you rather have for Christmas--(1) the movie projector or the tape recorder? (2) the trains or this book?

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Ph.D., Educational Psychology, City University of New York, 1982

Title of Dissertation: "The Effect of a Peer Model's Exploration and Expressed Affect on the Curiosity of Second-Grade Children"

Awards and Honors:

Dean's List, University of Vermont
Intermediate Year Fellowship, City University, 1973-1974
University Fellowship, City University, 1974-1975

Professional Experience:

Adjunct Lecturer, Psychology Department, County College of Morris, Randolph, New Jersey, September, 1978 to present.

Responsible for teaching courses in General Psychology to Continuing Education students.

Director of Education, Temple Beth Shalom, Boonton, New Jersey, September, 1980 to December, 1981.

Responsible for recruiting, hiring, supervising, and evaluating faculty, writing and implementing curriculum, working with children with discipline and/or learning problems, general supervision of the school.

Adjunct Instructor, Department of Education, Touro College, New York, New York, September, 1975 to January, 1976.

Responsible for teaching Psychological Foundations of Education course to undergraduate students and supervising field placement experience.

Adjunct Instructor, Department of Education, The City College of New York, September, 1975 to June, 1976.

Responsible for teaching Psychology of Learning and Child and Adolescent Psychology courses to undergraduate education majors.

Adjunct Instructor, Department of Education, Hunter College, New York, New York, Summer Session, 1975.

Responsible for teaching Psychological Foundations of Education II to undergraduate education majors.

Research Assistant, Department of Education, Baruch College, New York, New York, September, 1974 to January, 1975.

Assisted in compiling and evaluating behavioral objectives for the Competency Based Teacher Education Program. Worked with senior honors students on thesis development.

Research Assistant, Office of Teacher Education and The Institute for Research and Development in Occupational Education, Research Foundation of the City University of New York, September, 1972 to August, 1973, and February, 1974 to March, 1975.

- Experience testing children (K-6) for a research project involving hierarchical ordering of classification, conservation, and seriation skills.
- Responsible for supervising staff in coding open-ended quesionnaires for teacher morale survey for the Westport, Connecticut public schools and for presenting and interpreting results to Westport Board of Education, superintendent, principals, and EDP coordinator.
- Assisted in coding and EDP processing for evaluation of Teaching Trainers of Teachers (TTT) programs at Richmond College, City College,and Hunter College of the City University of New York. Responsibilities included on-site visits to participating New York City elementary schools.
- Assisted in evaluation of Educational Applications Assistance Group at James Monroe High School, Bronx, New York. Responsibilities included on-site visits and classroom observations, teacher conferences, developing and directing frequency-of-use record-keeping system for resource materials, contributing author for evaluation and progress reports.
- Assisted in evaluation of State Program to Implement Career Education (SPICE) in the New York City Public Schools. Responsibilities included attendance at and evaluation of teacher training workshops, assistance in curriculum development, on-site visits to elementary schools in Richmond, Bedford-Stuyvesant, and the East Bronx,

classroom observations, interviews with teachers for collection of evaluative data, compilation of data, contributing author for evaluative report.

- Assistant director for research project to evaluate New York State high school bookkeeping training programs. Responsibilities included the hiring and supervision of high school and college students, collecting, coding, and compiling data.

Fifth-grade teacher, Preston Junior High School, Harrison, New York, February, 1970 to June, 1972.

Responsibilities included teaching fifth-grade classes. Experience in semi-departmentalized, self-contained, and inter-class grouping structures. Additional responsibilities included the development and introduction of an individualized reading program to the school, remedial reading teacher for summer sessions, and girls' intramural coach.

Caseworker, The New York Foundling Hospital, New York, New York, November, 1967 to January, 1969.

Responsibilities included supervising foster homes, case work with foster children, foster parents, natural parents, liaison work with other professional agencies, functioning as part of a mental health team.

Professional Certification:

Elementary School (N-6) teacher, New York and New Jersey

Present Research Interests:

Systematic observation and delineation of the social, adademic, and personal skills which enable the individual to engage in effective academic and social behaviors in various situations. Application of findings to teacher and parent training.

Publications:

Abramson, T., & Fuss, C. Educational Applications Assistance Group, James Monroe High School: History and progress report. New York: Institute for Research and Development in Occupational Education, City University of New York, 1973.

Abramson, T., Kagen, E., & Fuss, C. Evaluation of the James Monroe High School Educational Applications Assistance Group, 1972-1973. Research Report No. 73-3. New York: Institute for Research and Development in Occupational Education, Office of Teacher Education, City University of New York, August, 1973.

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Kleefeld, C. F. Reinforcement therapy for severely and profoundly retarded persons: A guide for training paraprofessionals. In Hayott, M. A. (Ed.), Paraprofessional training manual: An inservice approach for training staff working with the severely- to profoundly handicapped. New York: Center for Advanced Study in Education, The Research Foundation of the City University of New York, 1977.

Zimmerman, B. J., & Kleefeld, C. F. Toward a theory of teaching: A social learning view. Contemporary Educational Psychology, 1977, 2, 158-171.

Professional Presentations:

Zimmerman, B. J., Blom, D., Kleefeld, C. F., & Ringle, J. Social influences on children's development of curiosity, achievement motivation and social gregariousness. Papers presented at 1980 NERA 11th Annual Convocation, Fallsview Hotel, Ellenville, New York, October 22-24, 1980.

Kleefeld, C. F. Tuning-in to adolescents. Workshop conducted at Professional Growth Day. Sponsored by the Jewish Education Association of Metropolitan New Jersey and Principals' Cooperative Exchange of Central New Jersey, Temple Beth Or, Clark, New Jersey, November 13, 1980.

References:

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