In the past many theoretical models have been offered to explain man's behavior in the environment. It has only been recently that some empirical work has begun to examine actively the relationship between an individual's behavior and cognition of the environment around him. The basic assumption underlying this paper is that the "internalized mental images of the physical surroundings," hereafter referred to as topographical representations (1), may be an essential component of the interaction between man and his environment. Therefore, the study of the development of topographical representations must be regarded as crucial to an understanding of man's behavior in the environment.

Researchers from various theoretical positions, e.g., Piaget (2), Piaget and Inhelder (3), Piaget, Inhelder and Szeminska (4), Bruner (5), Stea (6), Tolman (7), Hebb (8), Lee (9), Von Senden (10), have inferred from the complexity of an organism's behavior, the existence of some internalized schemata that enables it to represent actions, objects and their spatial relations. As a classic example of this type of inference, Piaget describes an incident with regard to his daughter:

At 1;4 (3) Jacqueline had a visit from a little boy of 1;6 whom she used to see from time to time who in the course of the afternoon, got into a terrible temper. He screamed as he tried to get out of a playpen and pushed it backward, stamping his feet. Jacqueline stood watching him in amazement, never having witnessed such a scene before. The next day, she herself screamed in her playpen and tried to move it stamping her foot lightly several times in succession. (2, p. 63)

The internalization of the playmate's action is inferred through Jacqueline's ability to reproduce the scene at a later time. Stea (6) in constructing a model for "mental maps" notes:

It matters not a whit that we cannot directly observe a 'mental map' or even that we cannot know for sure that it is actually there; if a subject behaves as if such a map existed, it is sufficient justification for the model.

These representations serve to facilitate a child's behavior in his surroundings, i.e., the child's ability to construct a topographical representation allows him to find his way around, to explore new territory without getting lost, and consequently influences the way in which the child relates to his surroundings. At the same time the child's experiences and activity contribute to the development of his representation of that environment. Thus, we find a constant interaction between a child's representation of an area and behavior in that environment.

Criteria For Methodological Analysis

The initial problem facing any such investigation of representations of large scale environments is that of how to elicit the topographical representation. This is especially important as we are confronted with a hypothetical construct (topographical representation), whose existence can be inferred only through some behavioral output (methodology). It is likely that the type of methodology used to externalize these representations will have some effect upon the final product, due to differences among the responses of individuals to a particular task and their level of cognitive development. Therefore, it is extremely important to recognize the possible effects that the methodology is likely to have upon the externalized representation.

In developing a technique for studying topographical representations in children, the investigator finds himself confronted with several factors to be considered with regard to the selection and application of a methodology: one set of problems is related to the characteristics of the experimental population; a second group of problems is linked closely with the theoretical base underlying the investigation.

Variables Related to the Experimental Population

In order to maximize the opportunity for the child to respond with an optimal performance, the methodology must be suited to the characteristics and abilities of the experimental sample. One question, therefore, which must be considered in the selection of a particular technique is what skills or abilities does the technique presuppose in terms of the child's mode of response? To examine an internalized
schema through a behavioral output, the investigator must be certain that the subject is capable of a wide variety of responses to a specific task. This is a necessary control for the possibility that a given response may be a function of an inability to perform a particular task rather than a consequence of the internal representation. Present indications from completed and ongoing research show that while we may approach an "ideal technique" for some age ranges, differential abilities in such areas as linguistic, motoric and graphic competence variables may cause some methodologies, which place a premium on such skills, to be unsuitable for use with certain populations. However, in looking at these age-related variables, we cannot necessarily select the lowest common denominator of the various modes of response, as some age groups may not be motivated to perform to their optimal capacity if the task is regarded as babyish or uninteresting. This motivational or interest variable may effect the investigator's choice of methodology or merely cause him to modify the instructions given to the child. Still another characteristic of the population which must be considered in selecting a methodology is its cultural and social background variable. The investigator must be certain that the population is well acquainted and proficient with the medium in which he is asking him to respond. Certainly it would be unfair to give a writing implement to a child who has rarely been exposed to crayons, pencils, pens or chalk and expect him to perform on an equal basis with a child who comes from a background which introduced these tools at an early age. Prior experience with the medium is also important as a control against novelty and fear, which could divert the subject's attention from the task to the medium or the experimenter himself.

Variables Related to the Theoretical Framework

It is important to realize that our theories and models of behavior exist primarily for the purpose of (a) organizing given behavioral phenomena into a comprehensible framework, (b) predicting future behavioral phenomena, and (c) explaining the relationships among various components of behavior. To attain any of these objectives, it is necessary that the theory be formulated in a testable way, such that some "critical experiment" can be performed, which can disprove the essence of the theory. Thus, there must exist the possibility of obtaining some evidence which will force the investigator to reject the theory or model. Unfortunately, rather than attempting to develop a better model investigators too often choose to add new constructs to the theory to account for the previously unexplainable phenomena. Such efforts lose the essence of the original theory, making it too cumbersome for practical use.

In almost any field we find investigators who have collected multitudes of data and yet are unable to organize their data into a coherent theory or conceptual framework. At the other extreme we find the theoretician who assumes a basic framework before dealing with the existing data or information. While the "obvious solution" lies on that happy medium point on the "theory without data-data without theory" continuum, such is easier said than done. Both the inductive and logical deductive approaches to the generation of theory necessitates that the researcher make certain assumptions with regard to the significant determinants of behavior. With an inductive approach the investigator must decide upon the relevant factors and dimensions of the data which are to be considered in the model. A deductive approach arbitrarily determines the relevant factors in behavior which are to be studied. Often the investigator overlooks dimensions of the behavior which may be significant.

It is neither my purpose nor interest to propose a resolution to this age-old debate between these two approaches to generating theory. Rather, I would like to suggest that researchers take a closer look at their empirical approach and begin to recognize their underlying assumptions. Too often investigators fail to acknowledge their biases and end up drawing conclusions with regard to questions which their studies are unable to handle. This is particularly true of theories whose assumptions allow them to ignore issues which other theories may deal with extensively.

To summarize this brief discussion of the influence of an investigator's theoretical bias upon his choice of methodology three points should be noted: the researcher's theoretical biases or assumptions tend to restrict the scope of a behavior considered in an investigation; the researcher should constantly test those assumptions with a "critical experiment" whose failure will force him to reject his model as a viable theory; the researcher should be aware of the limitations of any methodology so as not to make unwarranted inferences about issues which the experimental design is unable to handle.

Techniques For Eliciting Topographical Representations

For organizational purposes it is possible to dichotomize the techniques for eliciting topographical representations that have been used in past research, on the basis of the type of behavioral output obtained from the subject (11) (See Chart 1.)

The first type distinguished may be labeled external representations of the large scale physical environment. Methodologies contained in this category entail the construction of the
### Techniques for Eliciting Topographical Representations

<table>
<thead>
<tr>
<th>Technique</th>
<th>Outline of Procedure</th>
<th>Competence Variable</th>
<th>Illustrations of the Technique</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pictorial Sketches &amp; Drawings</strong></td>
<td>Subject is asked to &quot;draw a picture&quot; of an environment as seen from a horizontal or oblique perspective.</td>
<td>graphic</td>
<td>Anderson &amp; Tindal (24), Arnheim (25), Hart (22), Ladd (26), Lee (9), Piaget &amp; Inhelder (3)</td>
</tr>
<tr>
<td><strong>Maps Constructed by the Subject</strong></td>
<td>Subject is asked to show the location of objects in the environment, (a) at a reduced scale, (b) from a vertical point of view, (c) using designated symbols to represent landscape elements.</td>
<td>graphic</td>
<td>Appleyard (27), Gittins (28), Hart (22), Laurendeau &amp; Finard (15), Lynch (29), Piaget &amp; Inhelder (3), Piaget et al. (4), Rand (30), Shemyakin (31), Wood (32)</td>
</tr>
<tr>
<td><strong>Modeling Environments Using Toys</strong></td>
<td>Subject is asked to place toy block replicas of elements in the environment in positions corresponding to their placement in the environment.</td>
<td>motoric</td>
<td>Laurendeau &amp; Finard (15), Piaget &amp; Inhelder (3), Piaget et al. (4), Stea, Blaut et al. (21)</td>
</tr>
<tr>
<td><strong>Verbal Descriptions &amp; Reports</strong></td>
<td>Subject's verbal comments and descriptions of an environment are analyzed.</td>
<td>linguistic</td>
<td>Anderson &amp; Tindal (24), Gittins (28), Lynch (29), Piaget &amp; Inhelder (3), Piaget et al. (4), Von Senden (10), Boulding (33), Strauss (34)</td>
</tr>
</tbody>
</table>

![Figure 1a.](image)

spatial arrangements of landscape elements. Such response mechanisms include (a) pictorial sketches and drawings, i.e., graphic drawings of the environment from horizontal, vertical and oblique perspectives, (b) maps constructed by the subjects, i.e., representations of the environment at a reduced scale as seen from a particular perspective, using symbols to stand for landscape elements, (c) modeling with toy landscape elements, i.e., the construction of a representation of an environment with the use of toy (blocks) landscape elements, and (d) verbal descriptions and reports of experiences in a given environment. A second type of output, which has its origins in the rat-maze experiments of E. C. Tolman (7), involves inferences drawn from observable behavior of the subject. Methodologies in this category include (a) the work with animals in a controlled laboratory setting, (2) observations and inferences from overt behavior, which involve unobtrusive observations of children's play behavior, (c) inferences drawn from specific way-finding tasks and (d) inferences drawn from animal behavior in their natural habitat.

To explicate and illustrate some of the methodological criteria suggested in the previous section and the application of particular techniques to the problem of eliciting topographical representations, an analysis of one type of methodology modeling through toy play, as applied by Mark, Silverman and Stahlbush (12), will be undertaken. Particular emphasis will center around the techniques used to supplement the modeling procedure and the problems which the methodology as a whole is able to confront.

**Modeling Through Toy Play As a Means of Eliciting Topographical Representations**
<table>
<thead>
<tr>
<th>TECHNIQUE</th>
<th>OUTLINE OF PROCEDURE</th>
<th>COMPETENCE VARIABLE</th>
<th>ILLUSTRATIONS OF THE TECHNIQUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimentation with Animals</td>
<td>Animals (rats) are studied as they move through mazes. Their choices of pathways to the goal are noted for the effects of learning or &quot;past experience&quot; from previous trials.</td>
<td></td>
<td>Tolman (7)</td>
</tr>
<tr>
<td>Inferences from Animal Behavior in their Natural Habitat</td>
<td>Animal behavior is observed in a natural setting (e.g. in a jungle). Inferences are drawn about the internal processes responsible for particular behaviors.</td>
<td></td>
<td>Altman &amp; Altman (35)</td>
</tr>
<tr>
<td>Observations &amp; Inferences from the Behavior of the Subject</td>
<td>Experimenter observes the behavior of people in the environment. He then draws inferences about the processes underlying that behavior. These inferences are sometimes tested with a more controlled experimental design. This technique is often used in observations of children's play behavior in a naturalistic setting. Inferences are drawn about the underlying processes through analysis of the child's actions and verbal outputs.</td>
<td>motoric, linguistic</td>
<td>Freeman (36), Werner (37), Piaget, Brown (38), Mandler (39), Von Senden (10), cf. Shemyakin (31) who reviews some of the major Russian research. Piaget (1,40), Piaget &amp; Inhelder (3), Piaget et al. (4).</td>
</tr>
<tr>
<td>Way-Finding Tasks</td>
<td>The subject's movements in response to specific directions are observed. Subject is asked directions or locations of landscape elements.</td>
<td>linguistic</td>
<td>Follini (23), Lynch (29), Ryan &amp; Ryan (40)</td>
</tr>
</tbody>
</table>

Figure 1b.

Mark, Silverman and Stahlbush (12) conducted a pilot study for the purpose of (a) developing a methodology for eliciting topographical representations from children of elementary school age, and (b) generating hypotheses for formal investigation concerning changes in topographical representations that may be a function of developmental level. The sample included 31 children between the ages of six and twelve, from Weston, Massachusetts, an upper-middle class suburban community near Boston. These children, after having been categorized by their developmental level according to their performance on Piagetian-type tasks, were asked to build a model of "their school and the area around their school" using toy blocks (houses, cars, trees, schools, churches, etc.) to represent elements in their environment. To understand better the reasons for their decision to apply a modeling technique to the problem under investigation, a brief summary of Piaget's theory of intellectual development and the construction of the fundamental concepts of space from which the study was designed is necessary (13).
Piaget's Theory of the Development of Spatial Cognition

For Piaget the problem of intellectual development is one of an invariant structural sequence, i.e., the organism passes through a progression of stages, each qualitatively different from its predecessor and involving a hierarchic integration of structures formed at a previous stage. The mechanism of adaptation or change hypothesized by Piaget is one involving the assimilation of data from the external world (experience) into already existing and structured schemata and the accommodation or readjustment of the schemata to the new data. Change or development is the result of the progressive coordination or equilibration between the processes or assimilation and accommodation. Thus, the development of intelligence is seen as the result of a complex interaction between the organism and its environment (18, 19).

After much experimentation Piaget and his coworkers identified four major periods in the development of the fundamental concepts of space. During the initial stage, the sensorimotor period (birth to about two years), children begin to construct a system of relationships between objects and their actions upon them, thus coming to understand themselves and the objects around them as permanent entities in the environment. However, these achievements are made only on the level of action, rather than on a symbolic or representational plane.

The child slowly begins to internalize the actions that were constructed during the sensorimotor period. He becomes able to act upon objects that are symbolized or internally represented. During this preoperational period (roughly two to seven years) the child is able to perform elementary transformations upon these internalized actions. However, the child is still unable to coordinate them into a reversible system. The onset of the third stage, the concrete operational period (roughly seven to eleven years), is marked by the increased coordination of these transformations into what Piaget refers to as "operations" or a system of reversible internalized actions, i.e., what can take place in one direction may also occur in the opposite direction. Piaget (16, p.48) looks at an operation as an action whose origins lie in the sensorimotor schemata. Before becoming operational the actions constitute the nature of sensorimotor intelligence. Throughout the preoperational period, actions are slowly internalized, enabling the child to act upon symbols. However, these operations possess only faint signs of reversibility and do not become truly "operational" until the level of concrete operations. The major limitation imposed on the child by concrete operations is that the operations may only be applied to real objects. It is not until the level of formal operations (roughly 11 years and older) that the child is able to transpose these operations to the plane of abstract thought. The adolescent is capable of dealing with abstract hypotheses or propositions. Thus, "formal operations provides thinking with an entirely new ability that detaches and liberates thinking from concrete reality and permits it to build its own reflections and theories." (16, p.63)

The effect of concrete and formal operations upon the development of the fundamental concepts of space can be seen in the construction of specific spatial relations. An analysis of space led Piaget to three separate types of spatial relations: topological properties, the qualitative relationships such as proximity, separation, sequence and closure, which remain invariant under continuous deformation excluding tears and overlaps; projective properties, the relations constructed in terms of a particular point of view, which remain constant during transformations of perspective; euclidian properties, those relationships of a metrical quality that coordinate space with respect to a system of outside reference points. Piaget and Inhelder (3, pp. 17-79) and Laurendeau and Piard (15, pp. 28-110) performed a series of experiments dealing with the recognition of the shapes of objects by "haptic perception." Both sets of findings noted that although the child could form internal representations toward the end of the sensorimotor period, he could not construct or differentiate (in representation) the topological properties of objects until midway through the preoperational period. They also showed that the individual's ability to derive the ability to represent the projective and euclidian shapes of objects. However, the general coordination of the projective and euclidian relationships develop along with the formation of concrete operations. The final equilibrium of these spatial relations is reached only with the development of a stable reference system, at the level of formal operations.

Experimental Methodology

The fundamental assumption underlying the work of Mark et al. (12) was that the formation of topographical representations involves an application of these fundamental concepts of space to the problem of representing environments which are too large to be perceived at once. We can view this process as involving the construction of representations of areas which can be perceived from specific locations and the amalgamation of these individual images to form a topographical representation.

In an effort to examine the process of how the child organizes the individual images, the investigators needed a technique that would produce a representation in a form capable of being analyzed in terms of the spatial relations.
between elements. By looking at the child's ability to construct topological, projective and euclidian relations between objects of an area that he is unable to perceive at once, we may see some relationship between that ability and the child's developmental (operational) level. In particular we were interested in the effect of concrete operations upon the topographical representations of children, i.e., changes in the child's ability to construct a representation of a macro-scale environment that are a function of the attainment of a higher developmental level.

The need for such a representation suggested a methodology involving the construction of a map of some type of large scale environment. The map itself could be either graphic (drawing) or a model built with miniature replicas of landscape elements. As our specific interest in the effect of concrete operations would require us to work with children from the late preoperational stage (approximately six years) to the level where the children had clearly attained concrete operations (about eleven to twelve), we decided upon a nongraphic technique as there appears to be a significant difference in motoric and graphic ability between the ages of six and twelve years (20). Therefore, we selected a modeling procedure to elicit topographical representations.

The Task of Modeling

Essentially, modeling is a task which asks the child to "tell us what he knows" about the spatial arrangement of features of the environment through his placement of toy block replicas of landscape elements. The externalization of the representation is accomplished through what the author believes to be a process of the child's limitation of his conception or representation of the environment, i.e., we are attempting to look at the structure and content of the child's internalized schemata through his ability to adapt them to the demands of our modeling procedure. The use of the modeling task to elicit topographical representations requires the child to play with the toys in such a way as to mold his placement of them to his representation of reality. Thus, one hopes that during the modeling procedure, the internal representation will influence the manner in which the child uses and places the toys. However, it is possible that some of the younger children will not use the toys to imitate reality, but rather in a manner where they play to satisfy their own emotional needs and desires. In other words, we must be wary of the child who fails to adapt the qualities of the toys to objects in the environment. As an example of this phenomenon from my own experience, very young children often enjoy lining up toy houses and then driving a car over the roofs.

Here the child does not meet the demands of reality ("cars do not normally go on houses"), but may play in such a way as to act out his own fantasies and desires.

When working with children at the preoperational level, it is especially important to recognize the differences between these two types of activity. Children who use the toys to meet their own needs may reveal what would seem to be an inferior knowledge of the environment, whereas the real explanation could well be related to their response to the toys.

Several procedures have been suggested by previous work to encourage a use of the toys that would best externalize the child's representation of the area (21). If we choose to use a structured methodology, i.e., giving the child specific instructions concerning the use of the toys (e.g., "Show me your house and all the things around your house."), we may want to allow the child a period beforehand to play with them in an undirected situation. This would afford him the chance to act out his fantasies and become accustomed to the toys before being asked to perform a specific task. A second solution, geared primarily to use with younger children, has been suggested in one of the toy play methodologies used by Stea, Blaut et al. (21). In order to elicit representations of a landscape too large to be perceived at once, the experimenter simply asked the child to "play with the toys" on a piece of paper. The child's final placement of the toys was then marked and analyzed according to a set of criteria for determining their relation to typical landscapes. Piaget's use of his "clinical method" suggests another procedure to externalize the child's representation. By carefully observing and recording the spontaneous actions, comments and final output as the child plays with the toys, as well as posing questions to the child, the experimenter may be able to infer much about the nature of the child's representation of the environment.

To further insure comparability between subjects as they relate to the toys, an identification procedure, asking the child to name the toys, was devised. The technique finally arrived upon by Mark et al. (12) was patterned after a similar procedure used by Stea, Blaut et al. (21). Each type of toy landscape element (house, big house, car, truck, tree, church) was removed individually from a bag and shown to the child who was then asked, "What is this?" For any identification which did not correspond to our intentions, we asked the child if the object reminded him of anything else.

The importance of the identification procedure was highlighted in the pilot work of Mark et al., in which the identification procedure was dropped in the case of three of thirty-one.

1-3-6
models an interesting observation. In view of some preliminary findings of Stea, Blaut et al. (21) with regard to linguistic inputs and the verbal outputs in three, four and five year old children, one might tend to favor a purely unstructured play setting for the younger preoperational children, asking them only to "play with the toys."

For children above the age of five who are first becoming accustomed to directed activities, it might be possible to confront them with a more directed task. There still exist a number of possible types of instructions. The first would involve asking the child to construct a model of some general landscape gestalt (e.g., "a town," "a city," "Worcester," "the world," etc.) The major disadvantage to these directions revolves around the child's inability to comprehend the meaning attached to such words. (The work of Hart (22) suggests that it is not until the age of eight or nine that the child acquires an accurate understanding of such words.) Therefore, another procedure was developed by Mark et al. (12) in their pilot study with elementary school children. Working on the assumption that, in general, children should best be able to represent those areas which have a particular significance for them in their everyday routines, Mark et al. (12) asked children who were attending two schools in close proximity, to build a model of "your school and the area around your school." This afforded us the opportunity to draw comparisons among representations of a common area possessed by children at various developmental levels.

Mark et al. (12) posed the modeling problem to the child in a task-oriented situation. The experimenter asked the child to construct his model for some children who would be visiting the school, so as to enable them to find their way around the school grounds. There were several reasons for approaching the modeling procedure with this task orientation. In general, the children seemed to be more comfortable in a testing situation in which they would be performing as experts for the benefit of other children. This helped to overcome some of the initial fear involved in making a model. It also tried to induce them to include on their maps features which they, as children, thought to be important, rather than what might interest the testers. Furthermore, the task-oriented directions allowed the investigators an opportunity to supplement the modeling output with descriptions of the final product. After the child announced that he had finished constructing the model, the experimenter asked the child to explain the content of his map in the guise of a "tour" of the area, pointing to specific landscape elements as he described their functions. If the child forgot to identify any objects on the map, the experimenter would then question the child about them. In an effort to have the child acknowledge any distortions of which he may be aware in the spatial arrangements of objects on the map, the investigator asked the child if he would make any changes in the map were he given the chance to do it again. This marked the end of the modeling procedure.

Limitations Upon the Modeling Procedure

There are several limitations upon the modeling technique, related to its ability to control for experience. As applied by Mark et al., modeling was only able to deal with the child's general past experience in an area. While one can attempt to control for the experience variable by using children who had been (a) attending their school for a particular length of time, or (b) living in the same town since birth, such gross measures of control over experience may not be a true indicator of the children's experience in the area. Children explore different areas, play in different places (e.g., boys play on the baseball and soccer fields while girls play on swings and slides) for varying lengths of time. A more effective control of the child's experience in an area may be to study the formation of representations of a previously unexplored area, thereby affording the investigator the opportunity to note the specific areas that the child has actively experienced.

However, it may be difficult to use a modeling technique to look at the construction of representations of a previously unexplored area. First, a modeling task may only be performed in a quiet, uncongested room, away from the area being explored. Therefore, we could only look at the child's representation periodically, in a static state, losing the opportunity to observe the actual processes involved in their formation. Second, modeling, though revealing about the spatial relationships that the child can construct among elements, shows
little about the dynamic nature of the representation, i.e., what it means to the child in terms of his behavior and ability to find his way around the environment. It has been suggested from both Piaget's work and the study of the construction of a behavioral space by Follini (23) that some type of behavioral output, particularly the child's movements in the environment, may be more useful in this regard. Third, as was mentioned above, modeling can only deal with experience in a global manner. It cannot look at the processes occurring during the period of exploration.

While the modeling procedure alone may be inadequate to deal fully with some of these questions, we have found it able to serve as a basic technique which may be supplemented by other methodologies, including behavioral outputs, verbal descriptions and possibly graphic tasks with older children.

All of the children tested with our modeling procedure seemed to respond well in terms of relating to the toy blocks and their comprehension of and interest in the task. Piaget et al. however, did suggest a minimum age with which such a modeling technique could be used:

Children cannot be questioned below the age of four or five, which is when in Switzerland, they first enter the Kindergarten... Even between four and seven, children cannot be made to stay the length of the experiment, unless they became interested in the questions asked. (4, p.5)

Thus, we should be cautious in adapting the structured modeling procedure to children below the age of four. Perhaps when working with those younger than four, we should rely more heavily, as do Piaget and his collaborators, upon the spontaneous remarks and activity of the children during walks through the environment, i.e., their activity in the environment.

Summary
This paper has attempted to discuss some basic methodological issues in studying the development of topographical representations. It has shown how the overall selection and application of a methodology should be governed largely by the questions under investigation which are related closely to the theoretical framework underlying the research. The problem of modifying a methodology to minimize the competence motivational and sociocultural variables was also elaborated upon. These points were illustrated with reference to a pilot study based upon the developmental framework of Jean Piaget. The actual procedure finally adopted, as well as the reasons for modification and the addition of several techniques were explicated as they related to the variables under discussion.

Notes
(1) Shemaykin (31, p. 193) formally introduced the term "topographical representation" to refer to "a mental plan of some area which is a reflection in man's mind of the spatial placement of local objects in relation to each other and himself."
(11) The dichotomy presented here was initially suggested by Gary T. Moore in a research workshop at Clark University during the spring of 1971.
(13) For a more detailed summary of the development of the fundamental concepts of space, cf. Hart and Moore (14) and Laurendeau and Pinnard (15, pp. 8-17). A complete account of the findings of Piaget et al. on spatial cognition may be found in the following references: Piaget and Inhelder (3), Piaget, Inhelder and Szeminska (4, pp. 3-26). Also cf. Piaget (16) and Piaget and Inhelder (17) for excellent summaries of their overall developmental theory.

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