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Intuitive Understanding of Time and Space At the Age of Four

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INTUITIVE UNDERSTANDING OF TIME AND SPACE AT THE AGE OF FOUR

by

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INTUITIVE UNDERSTANDING OF TIME AND SPACE AT THE AGE OF FOUR

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The purpose of this study was to test the central hypothesis that "children by the age of four years construct accurate and lasting conceptions of time (past, present, future) and space (near and far away)." In order to test this hypothesis the researcher relied on qualitative research guidelines developed and published in recent years to address social science and educational research issues. The research design is especially applicable to young children where the researcher assumes the role of participant observer. In order to control for the context of the research, the children were observed for time and space cognitive constructions while being taught a curriculum designed to address those concepts in an age appropriate format. The curriculum was on social studies with an emphasis on history and geography.

The study was conducted in a private Montessori pre-school. The sample (n=8) was purposive and selected to identify sensitivity conceptual development of time and space.

The methodology used for collecting the data was action research and a survey questionnaire administered to the same children and parents after a lapse of time of three years. The data collected consisted of four anecdotal records and five visual

data response sets of maps made by the children with commentaries. These data were analyzed through de-contextualized/re-contextualized analysis, descriptive analysis and interpretation. The data collected by the survey were further analyzed through an evaluative and comparative analysis.

The findings support the thesis statement that children during their fourth year of life construct representations of space and time using "intuitive sensitivity", or intuition. The effects of a specially designed curriculum may have enhanced these constructions, but the data from the study do not permit a direct affirmation of those effects.

The study offers a basis from which to continue research into the nature, the limits, the extent and the boundaries of young children's understanding of time and space, and into the conditions under which this knowledge may occur and develop. These are questions concerning the epistemology of young children's time and space constructs which are in need of further inquiry.

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Josephine Barry-Davis

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CHAPTER I

INTRODUCTION

The purpose of this research is to test the central hypothesis that "children by the age of four years construct accurate and lasting conceptions and ideas of time (past, present, future) and space (near and far away)". In order to test this hypothesis, the researcher relied upon qualitative research guidelines that have been developed and published in recent years to address social science and educational research issues that do not lend themselves to a strictly quantitative research paradigm. The qualitative research design is especially applicable to young children where the researcher assumes the role of participant observer with the research subjects. In order to control for the context of the research the children in the sample were observed for time and space cognitive constructions while being taught a curriculum designed specifically to address those concepts in an age appropriate format.

Context of Study

The rest of the chapter is devoted to the context of the study and the nature of the curriculum used with the children in this study. The collection of data took place in a Montessori school of which the author of this study was the principal. The school was accredited by the AMI association , which is the International Montessori Association in the United States (Appendix A). Part of the author's academic formation

(Appendix A) was an extensive training in the Montessori philosophy and method, receiving a preschool and an elementary diploma for the teaching of children between the ages of three and twelve. During this training great emphasis was placed on the constant evaluation by teachers of all aspects of a child's school experience. The Montessori (1980) observation technique requires multiple observations, analysis, and interpretation. It is an on-going system of research. This evaluation process is exceedingly similar to the process of action research. Ernst Stringer (1996) explains such a process as "a complete recycling set of activities, or spirals aimed towards the well-being and the good of people" (p. 19) and represents a newly emerged paradigm in social science and educational research that has grown out of participant observer research design first used in anthropological field research (Mead, 1975).

As principal of the school which had been attended by the participants of this study, the researcher bore the responsibility for evaluating the short and long-term impact of the entire curriculum. In order to accomplish this task, evaluations of the children were performed not only through observations, but also through periodic surveys of the children and of the teachers on the level of academic progress of the school population. Therefore, evaluations of the students were collected, reviewed and used, by the principal, for the improvement of the school curriculum. The parents in the school signed a written contract allowing for this evaluation process to take place. Within this setting, the children's concerns and interests were explored through the constant process of observation, reflection, and action. This way of gathering information is unobtrusive, well suited to the young age of the children, and to the

subject of inquiry. The process revealed in young children patterns of thought that would allow them to construct accurate ideas of distant time and place. At this time very little research has addressed what children do and can do at an early age with regard to spatial and temporal constructs (Down & Liben, 1997). The present study contributes to furthering the research base regarding how young children construct and use concepts of time and space.

Observed Concerns and Interests of Children in Their Fourth Year of Life

The author of this study observed that some children, at approximately the age of four, become aware that life--existence--has both a beginning and an ending, as in the death of a grandparent or a family pet. The question "where do I come from?" is often formulated by some children of this age. It is often understood as a biological question and answered accordingly, but in these instances, although not found in literature, it was perceived by the author as one universal in nature, understood not only as a question of the children's own personal creation, but of creation itself, a metaphysical dawning and an awareness of self as an historical being placed in time at a certain place.

The author of this study observed other traits in some children's understanding that surfaced during this period of life, including a preferred sensitivity to the distant past, the "once upon a time" rather than the future which held death, although it was not entirely certain that death was the reason for this preference. Furthermore, the

author has also observed that children demonstrate an attraction to periods of pre-history or far away places which have no resemblance to the present. Other traits included questions about the past which are more universal than personal, with a certain satisfaction from learning sections of the past such as cave-people, castles and pyramids which could also have appealed to their sense of fantasy. Nevertheless, the overall uniformity of questions universal in nature that are asked by children at the same average age of approximately four (Bower, 1993) can be seen as stages of readiness (Bruner, 1963) or teachability (Montessori, 1980). The author of this study believes these are developmental states when thoughts which are in the process of maturing and are in a period of intuitive sensitivity give rise to specific inquiries. Vygotsky (1978) supports this belief. The author has observed children's questions and used them in developing a curriculum of instruction that stressed global history and geography. The program was entitled "The First Frontier" and became the special curriculum that set the context for the teaching of time and space concepts to the children in the research sample.

Creation of a Learning Environment

Before the implementation of "The First Frontier" program, the researcher gave particular attention to the learning environment, creating an educational milieu that was conducive to cognitive, sensorial, and emotional development. The author created an environment in which development and instruction influenced one another, with the experienced instruction producing further development, creating what

Vygotsky termed "a zone of proximal development" (Newman & Holman, 1993). To create this environment, particular attention was given to using children's sensitivity to color, textures, scents and music as a regular component of planned instruction (Figure 1). The author of this study has observed some that children between the ages of three and six have a preference for colors from the purple end of the spectrum and tints over shades. Wavelength may also have had an impact on the children's preferences according to Davidoff, Walsh, and Wagemans (1997). Consequently all the tables, stools, and chairs were soft pink, lavender, pale green and blue.

There were no designs of any sort in the room. The only designs were those created by the children as they worked with materials to make maps and other objects. It allowed the children to focus on the element to be learned. There was no confusion or distraction. At the center of the room a very large light blue rug with two concentric circles had a compass rose at its center. This space is where the children gathered to make maps on the floor with little rugs which they chose, again of soft colors. One wall in the classroom was decorated with large low panels in the successive shades of the spectrum. This is where the children's work was exhibited. They could walk along in front of the wall admiring this or that work. All other surfaces in the room were white.

Music with an even tempo was preferred by the children, such as baroque music. Cloth place mats were made of silk or satin, textures which they preferred above all others. These were also of soft colors. The children preferred fruit aromas over floral scents, consistent with the research results of Mongrieff (1966) and Yi Fu

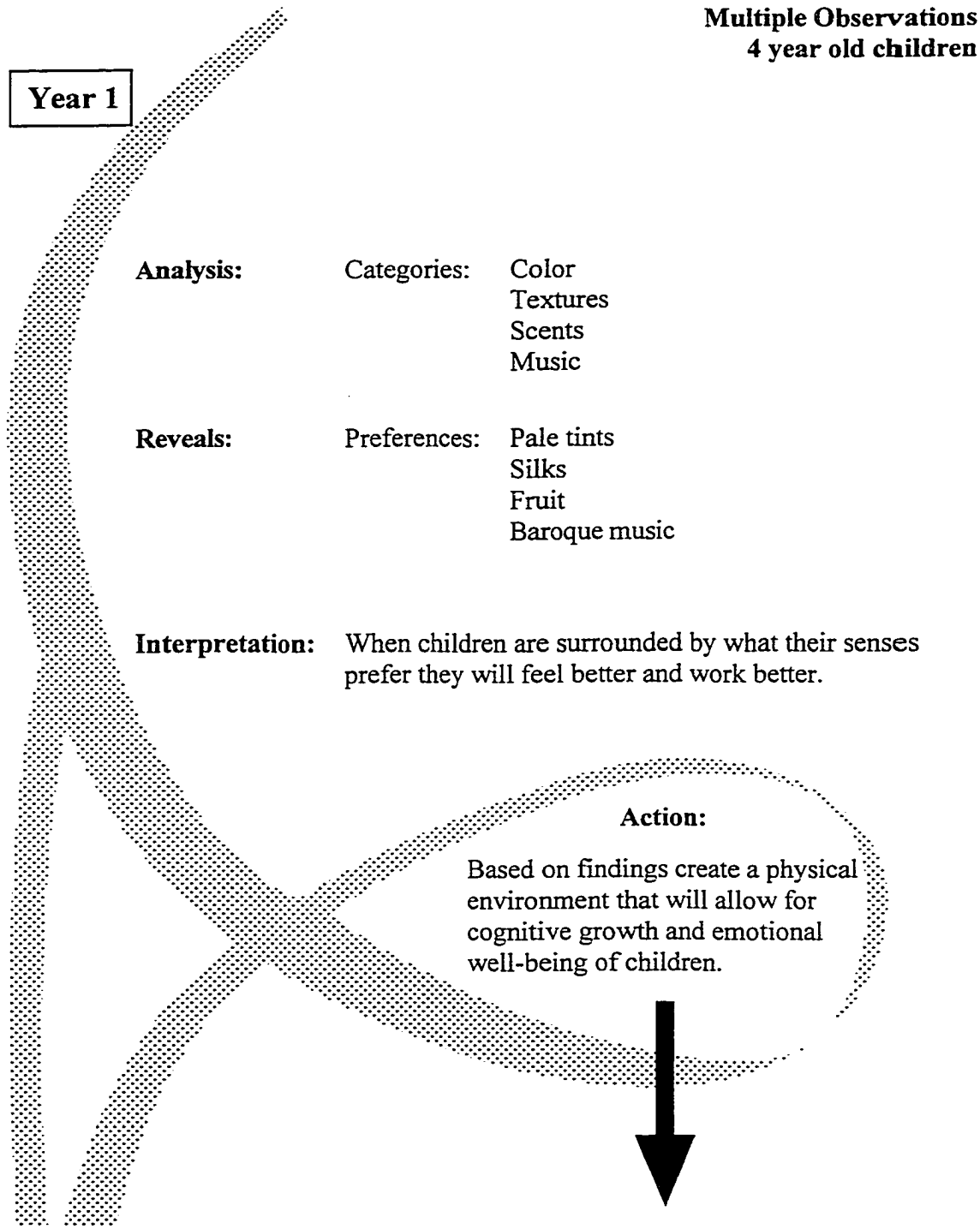


Figure 1. Intuitive Understanding of Time and Space at the Age of Four: Design of Optimal Environment.

Tuan (1987). Aromas which were pleasurable to the children were used, such as mint or vanilla. Hence, the learning environment and all curriculum materials created by the author were in accordance with these preferences predisposing the children to optimal learning.

Specially Designed Curriculum

The curriculum of "The First Frontier" addressed the concepts of time and space while using a specifically appropriate format according to cognitive abilities of children at the age of four. Research indicates that young children's understanding is comprehensive (Fuller, 1974), with a holistic view of reality accompanied by a myriad of questions. The young mind thinks in extremes, opposites, dualities or dichotomies of thought (Bettleheim, 1966; Egan, 1997; Krupp, 1997). Young children have affective understanding rather than analytical (Bruner, 1990) and they grasp reality through the mythical or the imaginary (Bettleheim, 1966; Egan, 1997; Sartre, 1972). This profile of children's modes of thinking guided the researcher in designing the curriculum, bringing the world and its history to the children's attention in ways they were best able to understand (Bruner, 1966). Places, people and events were presented in crisp, vivid, yet simple images. Only the most salient features were offered by consistently isolating the important elements and presenting them with clarity of form and content.

The environment, the materials and the curriculum were constructed to address both the sensorial preferences and the cognitive abilities of young children

with an age appropriate format and content, stimulating their ability to understand and learn while stretching their horizons of reality.

"The First Frontier" presented space as world geography and time as the history of people, in keeping with the time-space unity of the children's world view. The program was global, aesthetically pleasing and impressionistic. History was told in story form through the use of "once upon an time in a land far away..." which stressed the reality. Stories of the past or the far away were told to the children using the structure of fairy tales which present information in forms of dichotomies (Bettleheim, 1990) or dualities (Egan, 1997), where opposites are clearly drawn, and contrasts defined. Since children think in dichotomous ways, history told as fairy tales can only enhance its power to make meaning. Both the real and the imaginary (Cassirer, 1953; Dowson, Harris & Kavanaugh, 1997; White, 1990) were offered to the children. Each time they were told what it would be. The story form method of instructing history was coupled with the use of maps (Clary, 1987), globes, photographs and artifacts in the hope that it would enhance their ability to remember the subject matter. A mode of instruction called "dual coding" (Clark & Paivio, 1997; Schwartz, 1997), which appears to enhance long-term memory, was used. Content and form were powerfully crafted so that not only young minds were drawn into the intricate web of people at a certain time and place, but also the teachers'.

As the text of the program of studies carried the reader to the Middle Ages, the pages were of purple vellum inscribed in gold gothic lettering with illuminations. Each region of the world was thus treated with content and form intricately combined

(Bettleheim, 1977) . While only one page is shown, the entire textbook was in manuscript form with artistically-based textual design elements. Those physical qualities were designed to both edify and change the mind-set of the teacher and consequently the children to the concept of time in an historical sense (Appendix B).

As instruction in the program progressed, the children devised linguistic labels which were highly descriptive of distance in time and space. The extremely distant became "very, very far away", or "long, long ago", or simply "far away and long ago". One child was practical and spoke of doing "far and ago".

Another linguistic label which was quite particular to viewing people of the past was to indicate that they were "really dead" or "dead, dead!", demonstrating a strong underlying knowledge of language and a remarkable disposition toward making meaning.

The "The First Frontier" curriculum was introduced over a period of nine months (Figure 2). Concepts of time and space--the "once upon a time in a land far away" paradigm--were offered. Mapping skills developed and periods of history were labeled by the children as "...happened when time was gone and gone and gone".

Questions that were germane to the research question were then put to these children by the author to probe their construction and conceptualization of space and time. The protocol used to address space and time employed the following questions.

Space and time were addressed in this way:

1. Is this far away?
2. How far away is it?

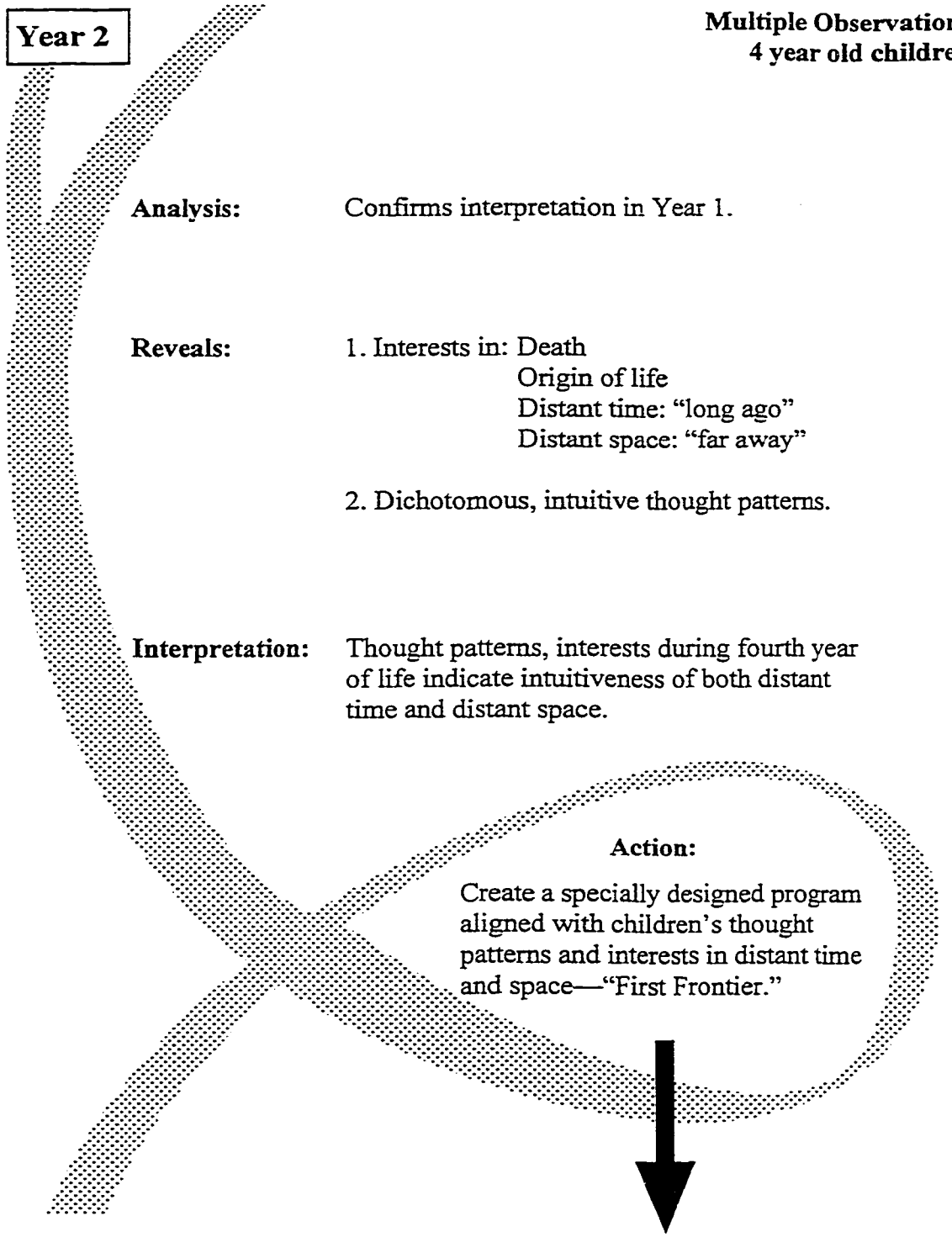


Figure 2. Design of the "First Frontier."

3. If you went there would you find these temples (or pyramids, or whatever they are studying at that time)?

4. And if you went there would you find the people who built these temples?

5. Why wouldn't you find the people who built these temples?

6. Is this a long time ago?

7. How long ago is it?

The following is an example of the process:

J. is sitting on the floor with a map of Africa and pictures of pyramids. J. is drawing a pyramid where the country of Egypt is. "Do you know what this is a picture of?" - *"Yes, the Pyramids. They are in Africa."* - "Is this far away?" - *"yes, very far away"* - " How far away is it ?" - *"Very, VERY far away!"* - "Who built them?" - *"People, from Egypt, but they're dead now, really dead!"* - "Did they die long ago or a long time ago?" - *"A long, long, LONG time ago"* - "Can you go visit the pyramids, to see them?" - *"Yes!"* - "And when you go there will you find the people who built the pyramids?" - *"No, because they are gone, they're dead, they died a long, long, LONG time ago!"*

The concepts of time and space were accurately seen by the children; the historical event of building the pyramids was in the "past", the pyramids were still there, but the people who had built them were "gone". Time had moved on.

After a lapse of time of three years (Figure 3) from the children's involvement with the specially designed curriculum a questionnaire was administered to the parents and the children. Its purpose was to probe the effects of the social studies curriculum

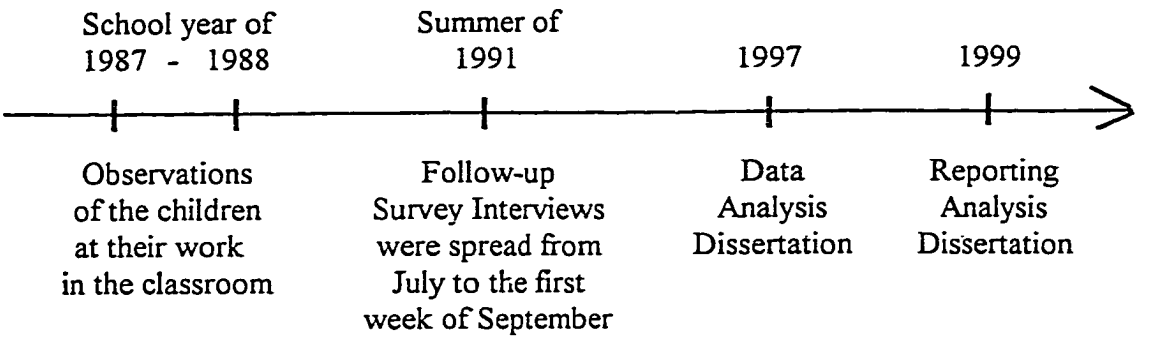


Figure 3. Timeline for Research.

and the possible impact which it might have had on these children's understanding of time and space, and if the construction of concepts of time and space had persisted from the age of four with these children.

In the lives of young children time and space are important because they form the basis for children to navigate in the three dimensional world of space and the chronological dimensions of time. As adults, everyone operates in those two elements. Second, the development of space and time as constructs provides a supra-classification system that many other elements of the environment are subsumed within. Third, the development of space and time may be a prerequisite to moving from an egocentric view of the world to a sociocentric view that provides at least some of the thought patterns necessary to overcome stereotyping of people and things.

CHAPTER II

REVIEW OF LITERATURE

Introduction

The context of the research with space and time and young children limits not only the research, but also prior research that was judged germane to the topic. Time and space are not overly researched areas with young children. When one looks beyond the works cited in this chapter, the number of research studies are few and not entirely related to the topic.

The research available by noted scientists and scholars in relation to time and space and children ranges from epistemology to philosophy. Therefore the structure of this chapter is purposefully drawn to move between the theories of leading psychologists, educators, historians, and geographers.

The chapter is divided into three sections: (1) developmental psychology, (2) pedagogy, and (3) philosophy, for it within the boundaries of such disciplines that the central hypothesis and methodology of this study finds support.

Developmental Psychology

This study draws from the works of Jean Piaget, Lev Vygotsky and Maria Montessori. These developmental theorists explored how learning and development

occur in young children. This was done by looking at all phases of development historically as a process of change from the emergence of a certain trait to its blossoming and fading. Piaget saw development along a continuum whereas Vygotsky saw development not only as an evolutionary or biological process but also as revolutionary change (Vygotsky, 1978). He indicated that these two concepts were constantly interwoven at each stage of a child's development, one affecting the other. Vygotsky theorized that children's thoughts, which are in a process of maturation but which have not fully matured, were in a "zone of proximal development" (Vygotsky, 1978, p. 86), and that if instruction was given at this time, learning would occur. Vygotsky suggests that it is at the very moment of learning a new concept that the process of development begins. This supports the optimal environment and curriculum created by the author of this study for the sample children–an environment in which development and instruction influenced one another, with the experienced instruction allowing for further development, creating a "zone of proximal environment." Vygotsky saw learning and development as a dynamic process, never quite aligned with one another. Vygotsky indicated that learning is activated through verbal and graphic speech, imitation and play which create a field of meaning between situations in thought and real situations. He spoke of these as "auxiliary or artificial stimuli" (p. 123) which humans use as a way of actively adapting both externally and internally, and that "human learning presupposes a process by which children grow into the intellectual life of those around them" (p. 86). Vygotsky based his approach to instruction on the premise that learning is a prerequisite to development, and that

instruction should be aimed at thoughts that are in the process of maturing and are in zones of proximal development.

Maria Montessori (1980) theorized about child development in a way similar to Vygotsky. She indicated that as children develop, they go through "periods of sensitivity", which are identical to the "zones of proximal development" that Vygotsky discussed. Much of this study's interpretation of child behavior is based on this observation. Both Montessori and Vygotsky advocated instruction at a moment of sensitivity, when thoughts are in a period of development.

In contrast, the work of Piaget assumes that learning can take place only at a time when a child's intellectual operations or mental processes have already matured. If this maturation of development was not completed, Piaget indicated that instruction could not take place and that it would be useless. Therefore instruction recommended by Piaget sought to teach only when the child was ready for it. To instruct before development had taken place would harm rather than benefit the child in his development.

All three theorists used detailed analytical descriptions based on careful observations. Whereas Piaget sought to observe children clinically, Vygotsky looked at the child in his normal setting, as did Montessori. Although Vygotsky's observations were similar to anecdotal records, they were analyzed to such a degree of "scientific rigor that observations carried the seal of validated fact" (Vygotsky, 1978, p. 14).

Although this research drew from Piaget's theory on stages of development, it pulled more from the theories advanced by Vygotsky and Montessori in that: (a)

observations were rigorously analyzed, (b) observations took place in the children's natural setting, and (c) instruction was given at a time when the sample children's thoughts related to space and time were in a zone of proximal development or period of sensitivity to time and space.

The schools of thought established by Piaget, Vygotsky and Montessori on child development have influenced both cognitive psychologists and educators. Piaget in particular has had an influence on how curriculum and instruction is used in American schools.

Pedagogy

The dominant structure of social studies curriculum used throughout the United States was established according to a pattern set in 1916 known as the expanding environment (Becker, 1991). It is designed to be taught in a developmental sequence from the concrete and familiar for the very young to the abstract and remote for the older students.

The expanding environment philosophy, which assumes the theoretical position that development is a prerequisite to learning, is based on Jean Piaget developmental psychology. Piaget's research was largely focused on the ability of children to measure time and understand territoriality. He wrote about the time concepts of succession, order, and duration. Those concepts constitute physical time, which Piaget believed young children could not understand. His research indicated that children can logically understand time and space only once they have reached their

middle years and have a certain level of abstract thought. Other child development researchers have speculated exhaustively over children and their sense of time (Allen, 1974; Clark, 1973; Fraisse, 1944; Harner, 1976), but almost always in keeping with Piaget's theory. Thus world history and world geography are not taught until 6th and 7th grade.

However, respected historians and geographers have recently expressed unease about this practice, which has become traditional rather than research based practice. Current research indicates that Piaget's work did not probe in its entirety the capacities of young minds (Astington, Harris & Olsen, 1986; Flavell, 1977; Fry & Moor, 1991; Perner, 1991). Current research also suggests that Piaget's theories may have been too rigidly interpreted (Castner, 1990) denying pre-literate children instruction of history and geography in spite of the fact that some research does indicate that children can engage in a primitive form of map reading, making and use (Blaut & Stea, 1974), and can, in the case of history, be quite at ease with the historical if presented in story-form (Egan, 1997). Piaget explored children's understanding of mechanistic, chronological time. This is not historical time, and to base the teaching of history on mechanistic time appears illogical. John Poster, in "The Birth of the Past," explores children's understanding of historical time (1973). He concludes that young children "do not develop a sense of historical time in a neat predictable way" (p. 597) and that teachers should re-examine the way history is taught. James Becker, in his report on global studies, voiced concern over the late and scant exposure to global history and geography that young children have and suggested that a curriculum established in

1916 can hardly prepare for life in the 21st century (ASCD, 1991). In 1993, the Goals 2000: Educate America Act allowed for changes to occur by including philosophy, the arts, and music in the field of social studies. But although the scope of social studies has broadened, its method of instruction has remained the same. The method of instruction is still based on the principal of expanding environments.

The Historical Perspective in Children

One can assume other perspectives of time beyond physical time, or mechanistic time. There is social time, literary time, personal time, and also historical time. Historical time is the time refashioned out of the past by historians, dense with people and events. Poster (1973) suggests that "a sense of the historical past is a sense of being in history rather that standing apart from it" (p. 589). Poster coined the term "historicality" which is a sense of one's own existence in history. In 1978 the French school system (Recherches Pedagogiques, 1978) adopted a program for children between the ages of six and eleven based on this concept. The children are surrounded by the past, the present and the future. It puts children in a historical period and a geographical location.

Poster (1973) proposes reversing the way the current school social studies curriculum is taught in the United States, giving ancient world history to the very young since they seem more at ease with handling the distant past. He indicates that these distant times are not confusing since they are not related to the child's experiential world and the many clock and calendar times it encounters there.

Understanding the Past

Concepts of time and space are intricately woven in a "time-space" unity. Nevins (1967) talks of this interdependence and tells how Immanuel Kant, when lecturing to his students, taught that history and geography were two parts of a whole. Norton (1989) speaks of "geographical imagination" (p. 191) which is an appreciation of and a sensitivity to the role played by space and place in our understanding of the world and its history. Norton emphasizes the need for geographical imagination to be actively taught to students and actively employed in research. Geography holds a particular quality in that it is at once "immediate and retrospective" (Braudel, 1990, p. 32), at times helping to shed light on events of the past, at times similar to the artifact in that it is a tangible link to the past, "its landscape filled with legacies of those who came before us" (p. 31).

It has further been concluded that children from Western societies have little sense of the past and develop whatever conception of it they are likely to achieve considerably past the age at which they master other ideas and perspectives (Poster, 1973, p. 193). In traditional societies, the past provides guidance for the future; study of the past is in fact rewarded by increased efficacy in dealing with the present (Poster, 1973). This is not so for Western children who are presented with versions of the past at a much later stage in their psychological development.

Creating a Global Perspective

In a survey summarizing global awareness, Torney-Purta (1982) examined the critical nature of the primary school years in the development of a global perspective. She states, "The first five years are unique, [and] at this stage few stereotypes are formed and the child is advanced enough in its social development to accept diversity of view points" (p. 200). Torney-Purta concludes by stating that the time for learning about the larger world from a global perspective should be before five. Although it has been determined that the proper roots of geography education are in early childhood education (Blaut, 1997), "as yet little research has been conducted to show what geography problems children can master at the pre-operational age" (Downs & Liben, 1997, p. 38).

Philosophy

Death and Time

The intuitive sense of time and the interest in the vastness of space comes at a time in children's lives when they sense the irreversibility of life and the inevitability of its final moment: death. Prior to this realization, a child's sense of time appears to be cyclical, similar to the Aristotelian time (Conford, 1952; Fraser, 1975) of the ancient Greeks, governed by patterns such as the seasons endlessly returning (Breisach, 1994). For the young mind life is eternal, believing that once one is old one will become young again (Piaget, 1972), eternally so, an endlessly cyclical life pattern.

Hegel (1956) tells us "time is what man makes of death" (p. 92). The knowledge of death disrupts the cyclical time concept. As children realize, at approximately the age of four, on an emotional level that growing up and getting older holds mortality, their minds move from simple consciousness to self-awareness and eventually to feelings and thoughts about the passage of time.

Understanding Children's Questions

Piaget (1972) noted that children ask endless questions between the ages of three and six as to the origins of all things: themselves, other people, earth, God, and death. He sought to interpret such questions as a child's way of systematizing concepts of the world. As a developmental psychologist, his observations of that period in a child's life were classified along a continuum of the developmental process. Piaget's observations and analysis were within the framework of developmental psychology.

However, if one leaves this framework and enters other intellectual domains, such as philosophy and metaphysics, a vast array of new perspectives is displayed and new interpretations are possible.

When children ask questions about birth, life, the moon, and the stars, they are looking for what exists and what is its nature, or "mode of being" (Goldman, 1993, p. 99). These are metaphysical questions in search of the reason and the nature of things all at once. The children "notice the movements of the heavens, while also becoming aware of the changes in themselves" (Fraser, 1975, p. 29). Time and space are

perceived along with the children's own awareness of their personal existence and that of the world. It appears that the concept of "time-space" is tightly linked to the onset of this awareness.

Time-Space Duality of Thought

In his inaugural dissertation at the University of Konigsberg, Immanuel Kant, in 1770, concluded that "the idea of time and space are pure intuition, time in particular is not real but resting on an internal law of the mind" (Fraser, 1975, p. 35). According to Hegel (1956) reality is divided into the spatial and the temporal, one being a reality of permanence, the other being a reality of change. The young mind awakening to life's structures of opposites and sensing the intersection of all sets of differences, seeks to extract meaning from both the temporal and the physical through an interplay of dichotomous thought. This duality of thought will eventually be filled with a network of conceptual relations.

Kant theorized that knowledge at its origin "is a notion of understanding the whole"; in other words understanding begins with the universal and moves from the whole to the parts (Goldman, 1971, p. 126). He explained that the first condition of knowledge is one of pure intuition; pure intuition is space and time. Space and time are the sensible (as felt by the senses) impressions of the whole.

Piaget suggests that one should wait for children to develop logical understanding before offering instructions in history and geography. Yet current research and practitioners suggest that young children can grasp the concepts of time and space

at a very young age (Figure 4). The nature of the human mind is one of duality, dichotomous in its balance of opposites, the one physical and the other temporal. The mind has a choice of using either the mythical or the logical in order to grasp the essence of time and space. Young children gain understanding through the mythical and, by the age of four, fully embrace the vastness of space and the passage of time. They are poised on the threshold of life, finding its meaning within the duality of the spatial and the temporal.

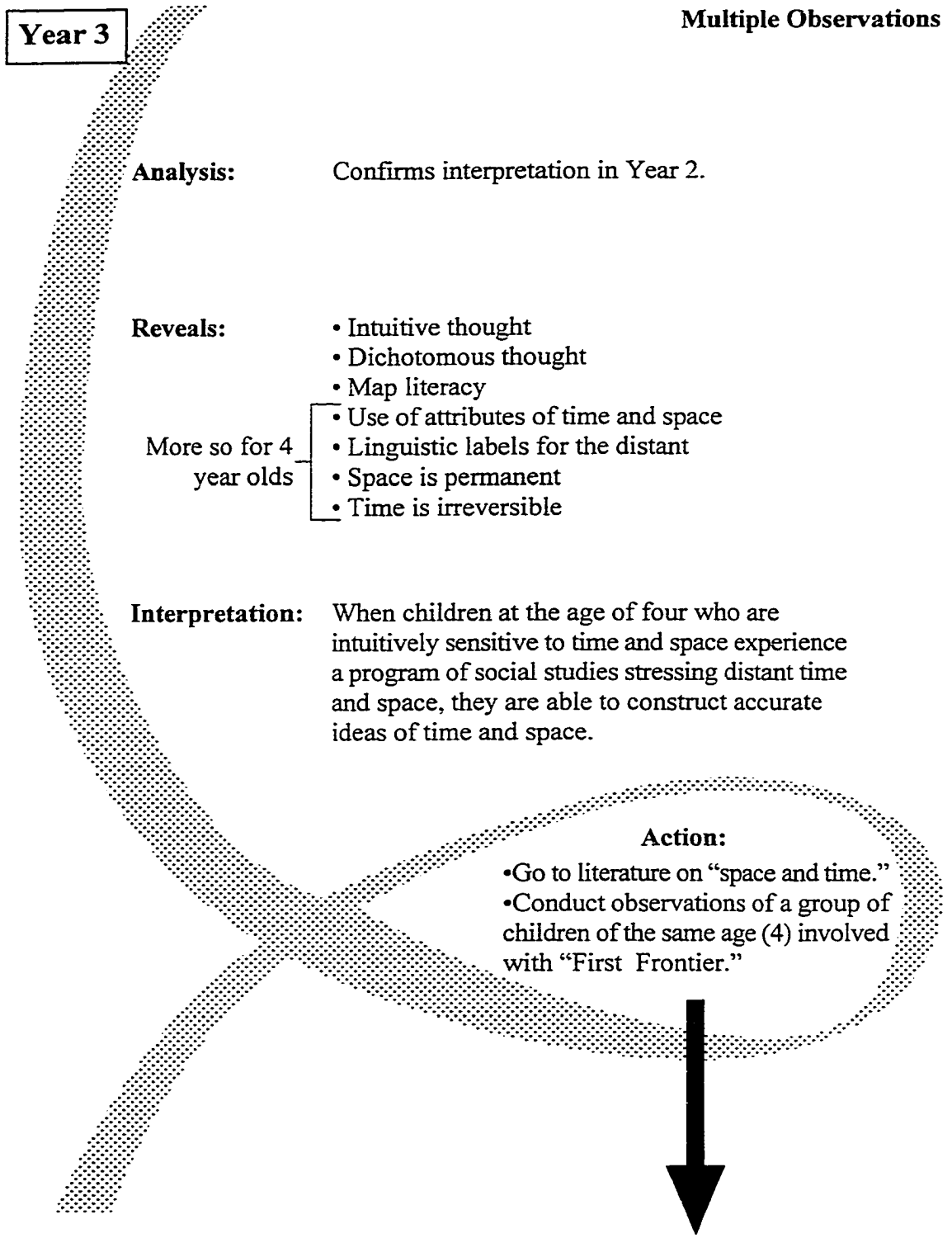


Figure 4. Children and "First Frontier."

CHAPTER III

METHODOLOGY AND DATA ANALYSIS

Overview

The purpose of the study is to identify intuitive conceptualization of constructs of time and space which children at about the age of four were hypothesized to display. The hypotheses that form the basis of the research are tested from empirical data collected by using anecdotal records, visual response and verbal responses to surveys, and other observational stimuli.

This study based its findings on data collected in four ways: (1) four anecdotal records reflecting children's understanding of time and space, (2) five visual data of children's drawings of maps illustrated with comments made by the children, (3) a survey questionnaire administered to the same children, and (4) a survey questionnaire administered to parents three years after the initial observations of the children. This study used de-contextualized/re-contextualized descriptive analysis and interpretation (Tesch, 1990) for the analysis of the data documents of the (1) anecdotal records (Figure 5). For the sake of convenience this process is called Analysis I. De-contextualized/re-contextualized descriptive analysis and interpretation were also used for the (2) visual data and context (Figure 5). This process is called Analysis II. For the (3) survey questionnaire both an evaluative and a comparative analysis were

De-contextualization First review: Located and underlined all the concept/sentences related to time and space. Second review: Extracted all the concept/sentences from the contexts Third review Labeled each concept/sentences according to the attributes as they emerged. One concept/sentence could have several attributes.
Re-contextualization The labeled concept/sentences were separated according to the category of time and the category of space.
Descriptive analysis Each context was then matched with its corresponding categories. The grouping of the contexts and the categories were described analytically according to the underlying meanings as revealed by the attributes of time and space. This allowed the researcher to view how the children through their behaviors, both verbal and psychomotor constructed and conceptualized time and space.
Interpretive review The analysis in the form of a review examined the descriptively analyzed contexts according to commonality and uniqueness.
Conclusive Interpretation A final interpretation summarized the results of the analyses of Analysis I and Analysis II.

Figure 5. Methodology and Analysis for Analysis I and Analysis II.

used.

Chronological Sequence of Data Analysis:
Analysis I, Analysis II and Survey

The methodology for this study was designed so that two subsets of the

central hypothesis presented in Chapter I could be tested. The hypotheses were:

Hypothesis 1: Children by the age of four demonstrate both verbally and in writing a conceptualization of time.

Hypothesis 2: Children by the age of four years demonstrate both verbally and in writing a conceptualization of space (Figure 6).

Hypotheses one and two were going to be tested using the empirical data collected by anecdotal records, visual stimuli, and verbal responses to a survey. The data necessary to test the hypotheses included four anecdotal records (Analysis I) and the five visual data from the children's drawings of maps illustrated with comments (Analysis II). These data were analyzed at the fourth stage of the chronological development of the study (Figure 6).

The methodology and the data analysis of the survey questionnaire are at the fifth stage of the chronological development of the study (Figure 5).

The Sample of Children in the Study

The sample (n=8) is purposive and selected to identify intuitive conceptualization of constructs of time and space which children at about the age of four were hypothesized to display.

The sample of children had common characteristics. All (a) had experienced a recent death in their families; (b) had verbalized concern over their existence, its origin as well as its end; (c) demonstrated a preferred sensitivity toward the distant past; and (d) had good small motor abilities and good verbal skills allowing them to express

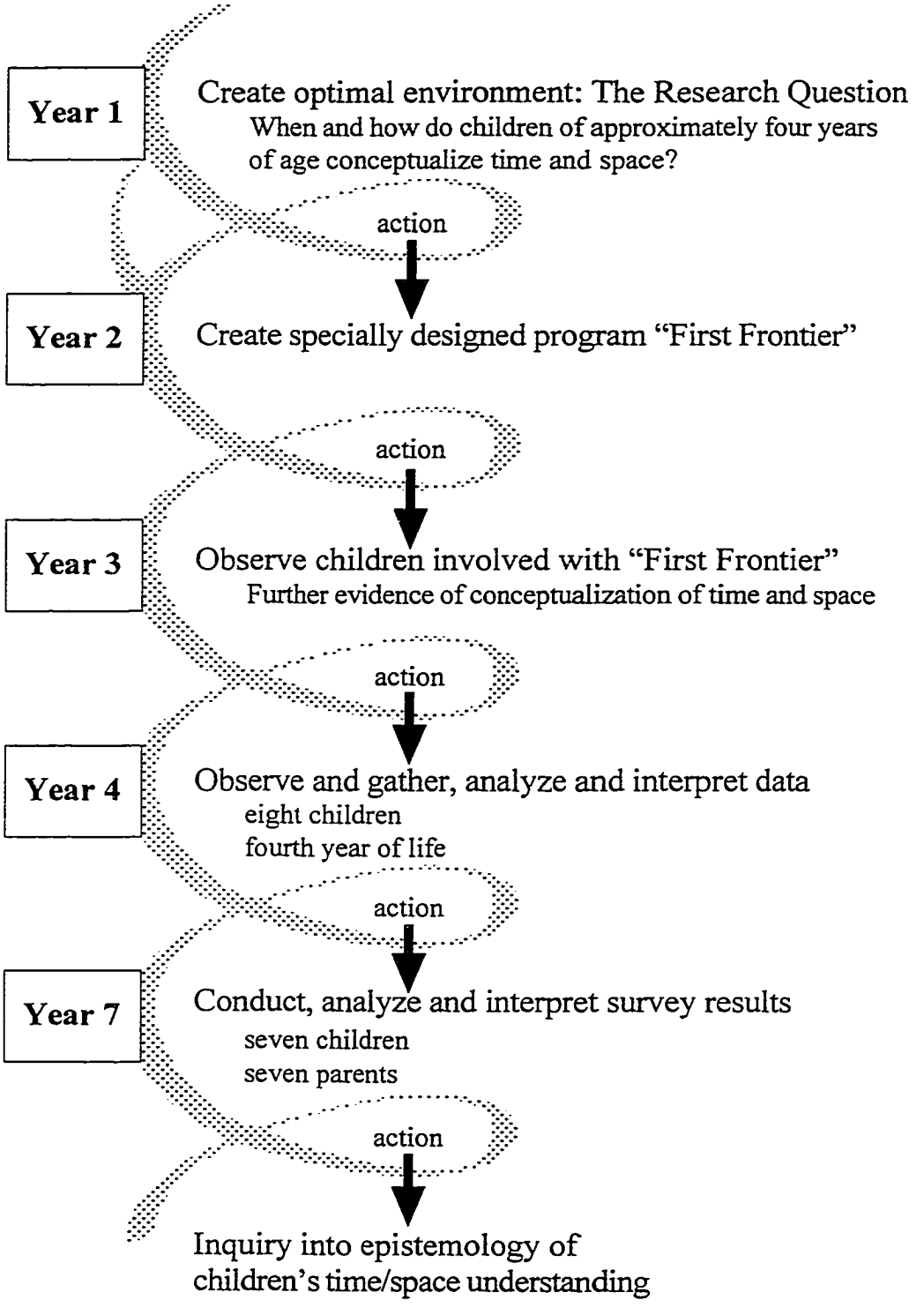


Figure 6. The Development of Time and Space Concepts: The Research Sequence.

their thoughts in a variety of ways. In addition all had started school together at the age of three and had built strong friendships with each other. The gender distribution of the sample was 4 boys and 4 girls. The sample of children was the source for all child oriented data including the anecdotal records (Analysis I) and the empirical observations (Analysis II). Seven of the eight children were available for the survey questionnaire three years later.

All but one of the parents of the children in the sample held university degrees. The parents generally demonstrated an interest in their children's education and re-enforced the goals of the program of instruction experienced by the children. The parents provided the parent survey information for all the children during the final data collection.

The confidentiality of the information collected was protected. The researcher changed the names of the children for purposes of anonymity. It should also be noted that the information collected during this study is not controversial or sensitive or in any way jeopardizes the well-being, livelihood, or professional standing of the participants. The parents of the children signed a school contract which informed them of data collection using both parents and children to be performed by the school and its personnel. Their signature signified consent for their child's participation in the study.

This research was approved under the exempt category of review by the Human Subjects Institutional Revue Board of Western Michigan University (Appendix C).

Observations: Analysis I and Analysis II

Anecdotal records and visual data with commentaries collected through observations during the school hours were the basis for the data. The researcher received training in ethnographic techniques during her Montessori training and university experience in completing this type of qualitative research.

The research anecdotal records and visual data with commentaries were collected over a period of nine months. Observations on children's interest in space and time were foremost in the observation protocol. Observation is the most unobtrusive and effective way of gathering information from very young children (Stringer, 1996).

Of all the situations observed, the ones that were unsolicited by a teacher, an assistant, or an older child were favored over others. If the children were left to their own devices and musings, uninfluenced by comments, suggestions, corrections, or any other interruption of their concentration, then these observations were of importance and kept. In these situations motivation was intrinsic--they liked what they were doing, they had chosen their activity on their own accord. The children's concentration was sustained, allowing for their thoughts to evolve and shift freely, at will, and they were involved with what they were doing and thinking about it. Comments made to the researcher were of their own choice; questions put by the researcher were calculated and measured in order to intrude in the least possible way on their patterns of thought. Sometimes observations did not involve communications between the child and the researcher. Situations such as these were rare but did occur. Those that

entailed communications were kept and were used as data for this study, whereas those not entailing communications provided direct observation of movement, behavior, and monologue or dialogue between children.

Data Collection

The data were collected between October 1987 and May 1988 in a private Montessori school in Kalamazoo, Michigan. The school was accredited by the AMI Association (Associazione Montessoriani Internazionale) in the United States, and the State of Michigan (Appendix A).

The observations were performed during the periods of free form activities which are typical of a Montessori classroom. The researcher collected data not as a clinical observer, but as a participant observer generally involved in the flow of activities. The researcher moved around the room, watching, listening, helping, but always attentive to any information relevant to this study. The goal was to observe without being conspicuous or intrusive. Notes were taken at times, which the children accepted as routine behavior on the part of the researcher. Figure 7 presents: the overlap of the ages of the children from the month of September, 1987, to the month of May, 1988; the ages of the children at the time of each observation; the frequency of observation for each child; the ages of the children in the month of September and the ages of the children in the month of May.

From the observations four anecdotal records (Appendix D) and five visual documents with commentaries (Appendix E) provided the data to be analyzed for this

Frequency of observations and ages of the children at which time the data was recorded

1 observation for age: 3 years and 10 months – Lillian
1 observation for age: 4 years and 00 months – Jack
1 observation for age: 4 years and 04 months – Emilia
1 observation for age: 4 years and 06 months – Emilia
1 observation for age: 4 years and 09 months – Arielle
2 observations for age: 4 years and 10 months – Joseph – Julie
4 observations for age: 4 years and 11 months – Joseph (2 times); Louis; James

Ages of the children in the month of September and in the month of May

Emilia: 4.01 in September – 4.10 in May
Lillian: 3.10 in September – 4.07 in May
Arielle: 4.00 in September – 4.09 in May
Louis: 4.02 in September – 4.11 in May
Joseph: 4.02 in September – 4.11 in May
James: 4.02 in September – 4.11 in May
Jack: 3.10 in September – 4.07 in May
Julie: 4.02 in September – 4.11 in May

Overlap of the ages of the children from the month of September till the month of May ("x" indicates when the children were observed)

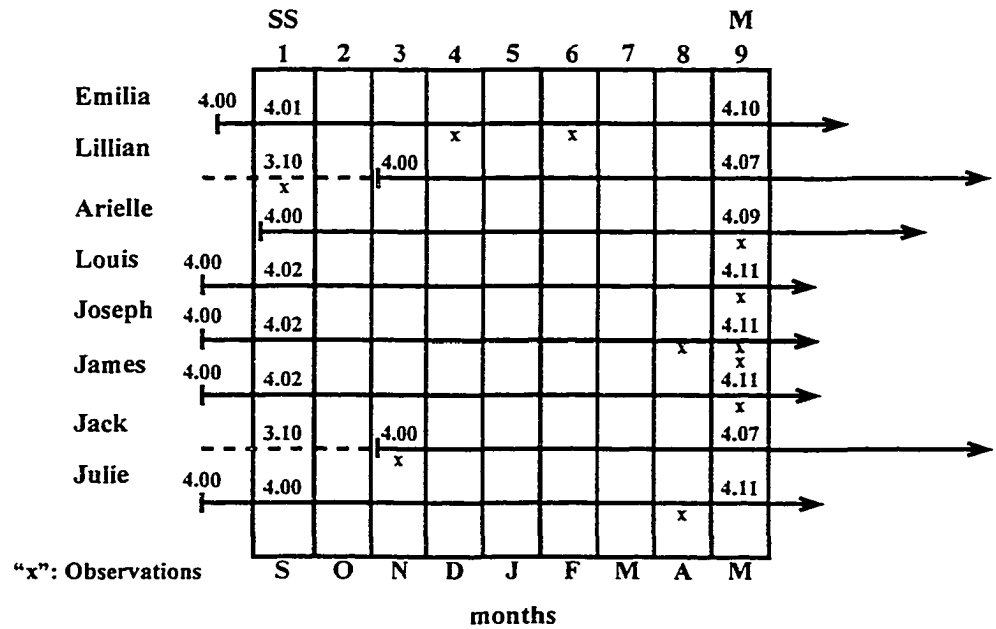


Figure 7. Specificity of Observations and Data Recording.

study.

Based on three previous interacting cycles, or stages of observations (Figure 5), which had revealed an intuitive sensitivity to space and time by the children, a decision was made by the researcher, who was then the principal of the school, to follow and observe a group of children for an entire school year, or as close to this as possible in order to find instances of interest of time and space. Children were chosen who were four years old and who were to experience during the school year a specially designed curriculum (Appendix F) in an optimal environment created to meet individual needs and sensorial preferences.

Methodology: Analysis I and Analysis II

The use of anecdotal and empirical visual data were important to the research in order to collect information applicable to the hypothesis being tested.

De-contextualized and re-contextualized descriptive analysis and interpretation (Tesch, 1990) was determined to be an appropriate method for data analysis because the purpose of the study was to look for evidence from the observation data of manifestation of mental structures which would be indicative of how children construct accurate ideas of space and time. The four anecdotal records and the five visual data with commentaries were analyzed and interpreted in the same four ways: (1) de-contextualization, (2) re-contextualization, (3) descriptive analysis, and (4) interpretive review (Figure 8). The anecdotal records were analyzed as Analysis I. There followed the analysis of the visual data with commentaries as Analysis II. The visual

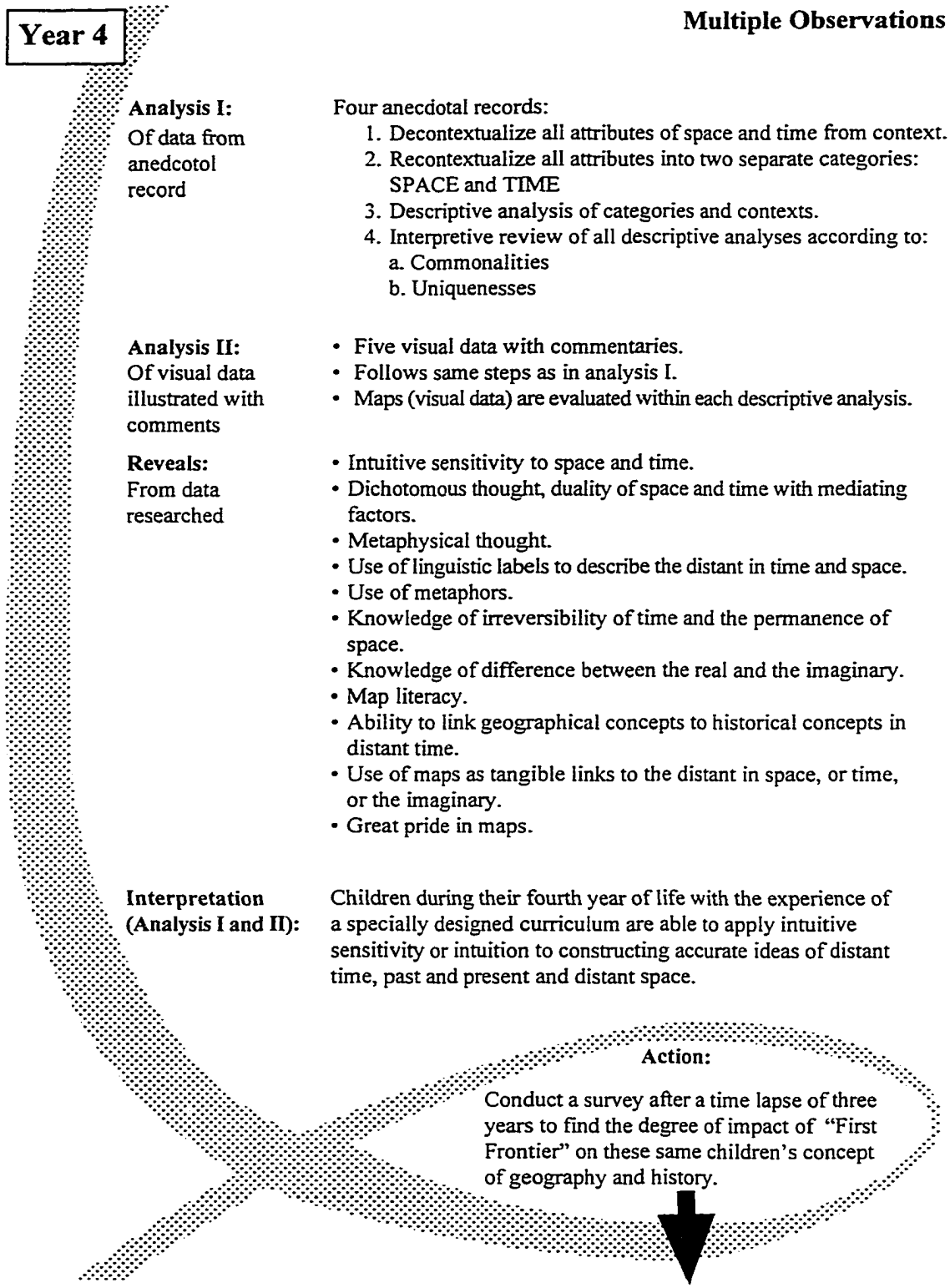


Figure 8. Observations and Analysis Sequence.

data, or five maps, were evaluated according to the accuracy of form and placement. They were also evaluated according to the "intent" of the child. If a map had many lines and numbers on it and the child said that it was a map for navigators, then the map was considered accurate even if the shapes and placements were not. The evaluation of the visual data was held within each descriptive analysis.

De-contextualization

De-contextualization is defined by Tesch (1990) as "the separation of relevant data from the context" (p. 118). The relevant portions of the text for this study are all concepts of time and space used by the children. The first review of the observations was completed in order to identify concepts related to time and space. The concepts were either one word or a short sentence. For convenience they will here be called: concept/sentences. The second review was completed to extract all the concept/ sentences of time and space from their context. A third review was completed in order to label each concept/sentence according to the attributes of time and space as they emerged (Figure 9). One concept/sentence could have several attributes.

Re-contextualization

The next task was to re-contextualize all the concepts of time and space that had been listed together. This required that the concepts contained in the list must now be separated according to certain categories. The categories chosen by the researcher were those of "space" and "time". Therefore all things done or said by the

CATEGORY: TIME

VASTNESS OF TIME
IRREVERSIBILITY OF TIME
TEMPORAL CHANGE
ORIGINS OF LIFE
ENDING OF LIFE
EVENT IN TIME
INTUITIVENESS (seeking meaning)
METAPHYSICAL CONCERNS (seeking nature and reason)
IDENTIFYING IMPORTANCE
AFFECTIVE UNDERSTANDING
LINGUISTIC LABEL
DIFFERENCE REFERENCE FRAME

CATEGORY: SPACE

VASTNESS OF SPACE
SPATIAL PERMANENCE
DISTANCES
LOCATION
IMAGINARY PLACE
MAP LITERACY
TANGIBLE LINK
INTUITIVENESS (seeking meaning)
METAPHYSICAL CONCERNS (seeking reason and nature)
IDENTIFYING IMPORTANCE
AFFECTIVE UNDERSTANDING
LINGUISTIC LABEL
DIFFERENT REFERENCE FRAME

PRAGMATIC ANAPHOR

Pragmatic anaphor is not an attribute of time or space but a way of expressing oneself. It is useful in the analysis of the texts.

Figure 9. Attributes That Emerged From the Category of "Time" and the Category of "Space".

children that were related to "space" were grouped together under the category of "space" and all things said or done that were related to "time" were grouped together under the category of "time" (Figure 10). This was performed for each of the observations and mapping.

. The labeled concept/sentences of time and space were separated into two categories: one of space and one of time.

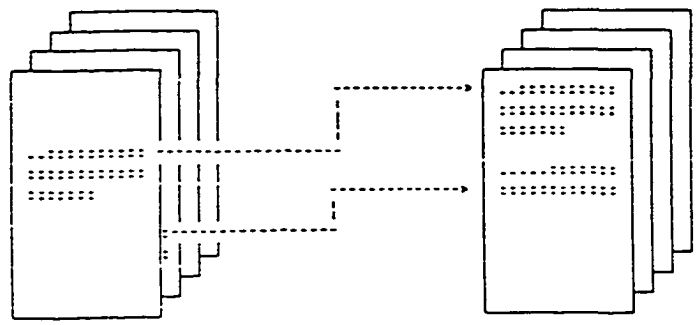


Figure 10. How the Observations Were De-contextualized and Re-contextualized.

Descriptive Analysis

A descriptive analysis of each of the grouping of the re-contextualized concepts--which were now within the categories of time and space--and also of the corresponding contexts was performed.

Each context was matched with its corresponding categories.

Each grouping of the contexts with their categories was examined and

described analytically according to the underlying meanings as revealed by the attributes of time and space. This allowed the researcher to view how the children, through their behaviors both verbal and physical, constructed and conceptualized time and space.

Interpretive Review

The interpretive review examined the descriptive analysis according to commonality and uniqueness.

Conclusive Interpretation

The conclusive interpretation summarized the findings revealed through the descriptive analysis and interpretive review of the four anecdotal records and the visual data with commentaries.

Methodology: Survey

Survey Instrument

The survey instrument (Appendix G) used in this study was designed to determine the extent to which the sample of children who had experienced a specially designed social studies curriculum during their fourth year of life held a lasting construction of time and space. The curriculum had a global form.

Survey research techniques were an appropriate method since one objective of

this study was to examine the effects of past, present, and future on children's construction and conceptualization of time. Space was examined using nearby, intermediate and distant spaces or places. The survey (Figure 11) attempted to evaluate the attributes of space as represented by geography, history as represented by time, and treatment as represented by the specially designed social studies curriculum.

The attributes of geography were: (a) maps, (b) types of maps, (c) maps and travel, (d) cardinal points, (e)drawing a world map, (f) naming continents, (g) care of the environment, (h) travel and people, (i) people and places of origin, (j) people and ways of behaving, and (k) reasons for differences among people.

The attributes of history were: (a) stories of the past, (b) famous people of the past, (c) groups of people of the past, (d) architecture, (e) museums, (f) artifacts, (g) collections, (i) music, (j) predisposition to learning in school, (l) strengths in school, and (m) aspirations when an adult.

Space-geography and time-history were the categories under which the data were coded and categorized (Appendix G).

Selection of Participants

From the sample of eight students who had completed the social studies program of instruction between the ages of four and five, seven students were available three years later to respond to the survey. The survey administration procedure used a parent/child dyad. Each of the surveys elicited both visual and anecdotal data.

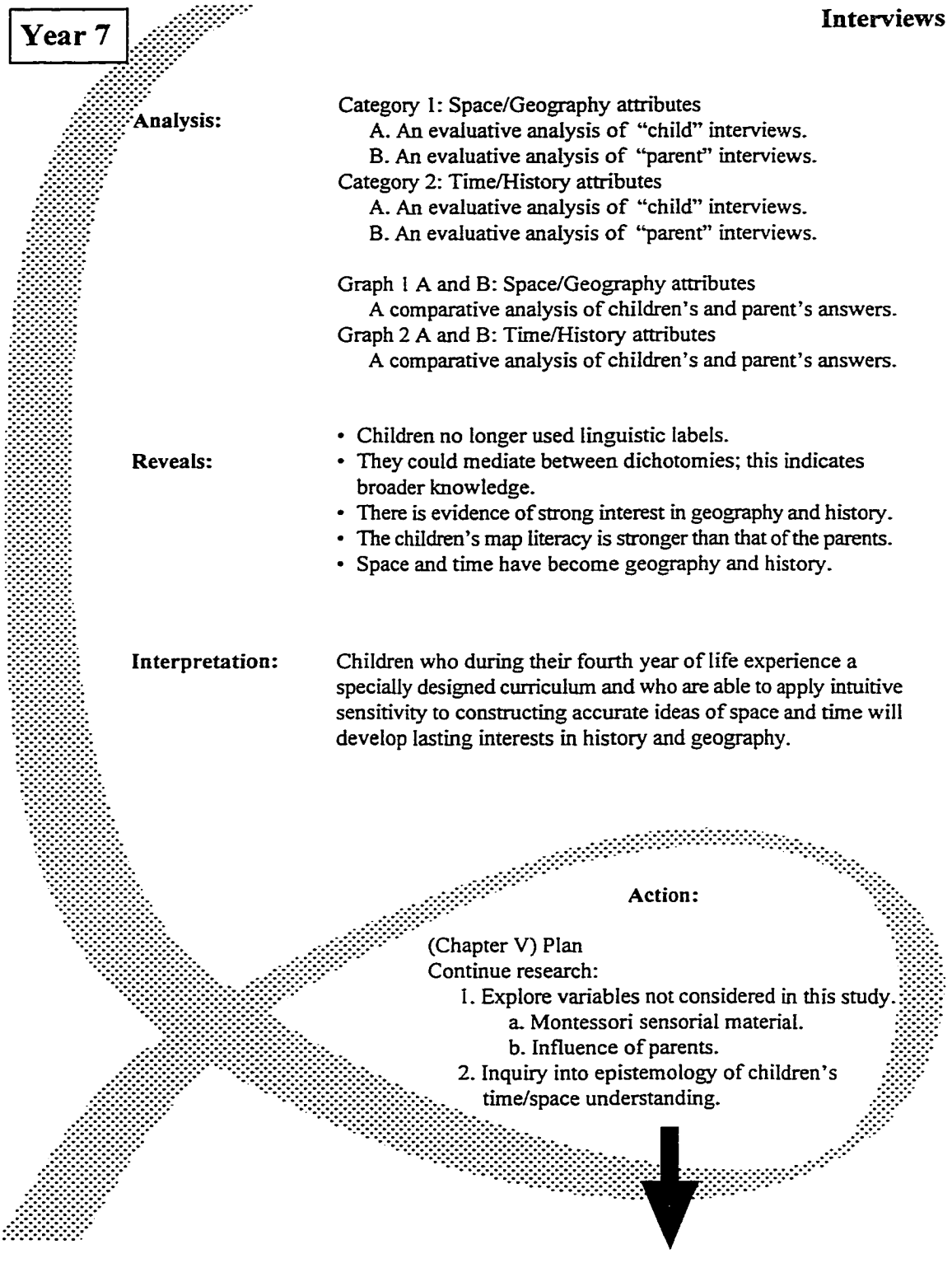


Figure 11. Child and Parent Interviews: Three Years Later.

Survey Interview and Questionnaire

The survey instrument was a semi-structured individual interview and a questionnaire with open-ended questions (Appendix G).

The method of collecting the interview data was face-to-face individual interview where the researcher recorded in writing the responses of the participating child and parent. These data were classified under the two main categories of space-geography and time-history.

The questionnaire was composed of open-ended items. The respondents were asked to provide their own answers. The questionnaire was completed at the same time the interview took place.

The interviews were semi-structured, consistent with prior research by Isaac and Michael (1990, p. 134). Although the interviews were built around a structured questionnaire, probes were used to elicit detail and further explanation of concepts from the interviewees (Appendix G).

The interviews were centered on the child's interest in geography and history. Each child was first interviewed alone. The time necessary for the interviews varied from child to child. Following the interview with the child, the mother was then interviewed. The length of time was more uniform and lasted from 30 to 35 minutes. The same questions were given to both the child and the parent. Their responses were compared and analyzed. The researcher conducted the interviews.

The researcher completed a series of tasks to prepare for and complete the

interviews. First, the parents were contacted by telephone explaining the objectives of the study. Second, the interviews of both the child and the parent were completed (a total of 14 interviews). The content of the interviews was coded according to the attributes of the categories.

The data collected from the interviews with the seven children and seven parents were organized on a bar graph for each category, and on the bar graph:

1. The space-geography answers were compared.
2. The time-history answers were compared.
3. The maps made by the children and by the parents were compared.

Validating the Study Procedures

The validation of the study and data collection were judged or chosen based on the criteria established by Lincoln and Guba (1985). They include credibility, transferability, dependability, and confirmability.

The study satisfies these criteria by (a) gathering data representing three variants of the same reality through observations, visual and verbal data, and the survey of participants three years later; and (b) through interpretive, descriptive analysis of the emerging themes and discussion of these findings with practicing educators outside the study. Practicing educators were shown the responses made by the interviewees. This additional data set correlated with the findings, and therefore was not considered in the study.

Transferability is the process of "thickly" describing the time and context of

the inquiry (Lincoln & Guba, 1985). The study described all aspects surrounding the collection of data.

Dependability is the process of demonstrating credibility of the process of inquiry during the study. Detailed notes and descriptions of the development of observations, visual data, questionnaires, and the data analysis procedure were carefully developed for the study and reported.

Confirmability is the degree to which the findings of the inquiry grow out of subjects and conditions, not the bias of the researcher. The study provides detailed descriptions on the mode and provenance of the data, and the professional role of the researcher in the data collection and analysis central to the research question.

CHAPTER IV

PRESENTATION OF DATA AND FINDINGS

Overview

The presentation of data and findings follow descriptive analyses and interpretive review of the de-contextualized and re-contextualized observations: (a) anecdotal records, (b) visual data of children's drawings of maps accompanied by comments made by the children, and, (c) the evaluative and comparative analysis of the survey.

Analysis I

Descriptive Analysis of Each of the Four Anecdotal Records

The descriptive analysis of the four anecdotal records is based on the re-contextualized analysis of the observed behaviors and the corresponding anecdotal record contexts (Appendix D). The researcher used both the anecdotal records and the corresponding re-contextualized analyses of the anecdotal record contexts to process the space and time construction and conceptualization reflected by the behavior, both verbal and psychomotor, of the children in the study.

Observation Context 1

Emilia (four years and three months): A frosty morning. White shadows

linger at the edges of the playground. The children are in their usual throes of jocund hilarity. Emilia shivers too. "I'm cold." I open the flaps of my coat and we huddle. I smile down at her. She looks past me and a finger shoots out from under her chin. "Look! the moon!...it's still there...it's very very far away...I saw it last night, did you?" Silence. "When I grow up, I will always see it, do you?...When people die they don't see it...I'm not going to die for a long, long, LONG time!" Emilia shivers and shakes her head emphatically. Silence. "Why is it?...you know, the moon?" A swarm of screaming children run by. With a backward smile Emilia bounces back into the immediacy of her life.

Descriptive Analysis. This thought process is indicative of the child's knowledge of the irreversibility of time and the inevitability of death, an intuitive sense of time and change, and the sense of space and its permanence. The question "Why is it?" is purely metaphysical in that it seeks to know the reason and the nature all at once. Emilia's sense of reality is both spatial and temporal, revealing the very nature of the human mind which is one of duality, a dichotomy of opposites, embracing both time and space (Appendix D).

Observation Context 2

Lillian (three years and ten months): Lillian is drawing a picture of a pyramid. The angle of the perspective is very unusual. It is from above, a bird's-eye view. I crouch beside her. She smiles shyly. "This is my pyramid." I smile back. I ask if she

wants to tell me about it. She looks at me for a while. "Well, deep, deep inside there..." she puts her finger on the drawing and then puts her face very close to her finger, "...there is a MUMMY." She says the last word in a whisper and silence follows: "...and out of this mummy comes this thing with wings." She pauses and looks at me and in a normal voice asks: "What do you call this thing?" I tell her. She looks at me, doesn't repeat the word, but asks: "Do we have one of those?" Before I could answer she tells me that she thinks that it is a ghost, she nods affirmatively, and continues: "This thing...it is flying up here." She puts her hand above the pyramid to show me. I ask her if she thinks the people who built the pyramids are still there, would she find these people if she went there? A big smile sweeps over her face: "Mrs. Davis!!! They are all mummies! They died! They died a long, long, LONG time ago!" I nod, we smile. "I'm going to finish my pyramid now, okay?" I am dismissed.

Descriptive Analysis. This thought process is indicative of the child's intuitive knowledge of death, the irreversibility of time and the permanence of space. There is also indication of a mediated dichotomous thought process: Egyptians lived and built pyramids, they died and had "ghosts" which is a mediating factor between the duality of life and death. This thought process can give access to abstract thinking since it is a mediation between two opposites (Appendix D).

Observation Context 3

Arielle (four years and nine months), Louis (not quite five), Joseph (not quite five): Arielle and Louis are sitting side by side at a table. Arielle is leafing through a storybook on Hopi Indians. Louis is coloring a map of Africa. He has taken all the green pencils in the classroom. After some noisy leafing through the book Arielle declares: "That's where I come from: the sun! Louis, listen to me, Louis do you want to know where I come from? First I was in heaven, then the rays of the sun and God made me the way I am, put me in my mother's tummy and...." Louis interrupts her: "There is no heaven, just clouds, and you didn't come from your mother's stomach because then she was a little girl...." He pauses for a while. "I come from Africa!" Arielle looks at him sideways. He continues: "...where my mommy comes from and my mommy's mommy and my daddy's daddy and there was forever...." He says the last words very slowly. Arielle hasn't moved; he is silent for a while. Still looking at his map, he says: "I guess they came from heaven, or the clouds..." He thinks for a moment longer. Joseph who was working close by turns to Louis: "Louis, I think you come from Borgess Hospital, that's where I come from...." Two children interrupt the scene by reclaiming the green pencils.

Descriptive Analysis. Three children are involved in this observation. Two have interpretations of the origins of life. Arielle shows the importance of her thought by forcefully inviting Louis to listen. Her knowledge of space are God and the Sun; the mediating factor is her mother. Arielle is seeking the origins of life. Her

knowledge of time reveals itself in the chronology of events she describes as her arrival on this earth. Louis looks at the origins of life through the map he is coloring and uses it as a tangible link to the past. His linguistic labels create meaning through the repetitiveness of his words. These labels reveal his thoughts on time and space. His thoughts are intuitive, they are looking for meaning; they move from the chronological passage of his past generations to thoughts that question the origins of life. The only answer he has left is that life begins with "God" or the "clouds". Louis is seeking the origins of life--not only his own life but life itself! Joseph's thoughts are over an event; that of his birth. He is not seeking the origins of life (Appendix D).

Observation Context 4

James (four years and eleven months): All the children have either gone outside or into the playroom. James is turning the pages of a large book; Peoples and Places of the Past, National Geographic. I walk toward him and kneel close to him. He is looking at Knossos and the frescoes on the walls of the palace. "Mrs. Davis, don't you wish you could go there? I wish I could go there!" I suggest that he can go there someday. He shakes his head. "No, it won't be the same because the people won't be there--they are all dead! I want to talk to them, don't you?" I nod my head. He continues: "I can see the buildings if I go there, but I want to talk to the people who built them..." Heavy sigh. " I wish I could go there." Since the classroom is now empty I suggest that he can take the book into the playroom. He looks up, shakes his head and then with one last look at the book dashes into the playroom. As

I close the classroom door I hear James' voice, strong, clear, commanding: "Let's play Persephone! I'll be Hades, Arielle, you be Persephone, Kelly, you be Demeter."

Descriptive Analysis. This thought process is indicative of the child's knowledge of death, the irreversibility of time, and a sense of the permanence of space. His understanding is affective in his desire to find those who built Knossos. His thoughts not only reveal dichotomy in his understanding of time and space, but also the limitations of reality; one cannot go back in time!. He mediates through the imaginary! Also he demonstrates both historical and geographical literacy by identifying a style of architecture which he attributes to a certain group of people at a certain place in time: Greek architecture. If he goes to Knossos, this will be a tangible link to the past. In the present the tangible link to the past is through the imaginary: he knows that he cannot go back in time but he can re-enact the Greek past (Appendix D).

Interpretive Review of the Descriptive Analysis of the Anecdotal Records

The descriptive analysis of the four anecdotal records allowed the researcher to discern a mental construction which held both a commonality and uniqueness as the children spoke of space and time.

Commonality

Of the four anecdotal records reviewed, four: revealed dichotomous thought of time and space, the knowledge of the finality of death, the irreversibility of time, the

permanence of space; used linguistic labels; identified the importance of their discourse; were affectively involved with the subject matter of their discourse; used objects as tangible links to the past, the future or the physically remote, and the moon, maps and a book.

Uniqueness

Through the analysis of the four anecdotal records the uniqueness of certain mental structures was revealed. One (Emilia) sought to know the reason and the nature of the moon all at once in her question: "Why is it?". A metaphysical query. One (Lillian) sought to mediate between the two opposing concepts of life and death. She saw life and death and its mediation in what she called a "Ghost". This is an indication of mediated dichotomous thought, which is an understanding of the whole that has, in Lillian's case, moved toward an understanding of organizing concepts. This thought process gives access to abstract thought. One (James) sought to mediate between the present and the past through the mythical. He could not go back in time to Greece so he re-enacted a Greek myth. One (Louis), who saw the chronology of generations, its endless repetitiveness, offered this comment: "...and there was forever...", uniting in one thought both time and space.

The unique responses may be categorized as follows: two out of four demonstrated historical and geographical literacy; two out of four sought the origins of life.

Analysis II

Descriptive Analysis of the Five Visual Data With Commentaries

The analysis of the five sets of data recorded visually by the children followed this procedure. The data from the observations were re-contextualized. Each component of the contexts space and time were then analyzed, and the visual and verbal or commentary contexts were examined to determine the degree to which they complemented each other (Appendix E).

Visual Data With Commentaries 1

Jack (four years exactly) [see Figure 12]: Jack is sitting very straight with four pieces of paper in front of him. Each paper has a map on it. He re-arranges the papers several times. They have an order. He looks at me several times. "Are you going to take my picture?" He is proud of his work. We take his picture. I sit down next to him. He asks me if I am ready. I smile, yes, I am ready. "Okay. This is a round world. I made this for people to see and to go on. It is a world." And so I ask if it is our world, the Earth? He says no, it is just a world. I ask about North, South, East and West, he says that "that doesn't exist there." On to the next map. "This is North America. It's a real place, really real, cowboys live there, it's only a piece of the Earth...yes, North America has North, South, East, and West, and it is round because somebody told me and I listened!" He points correctly to all directions. I ask about the third map. They look like a bunch of scribbles. "I made a continent, a

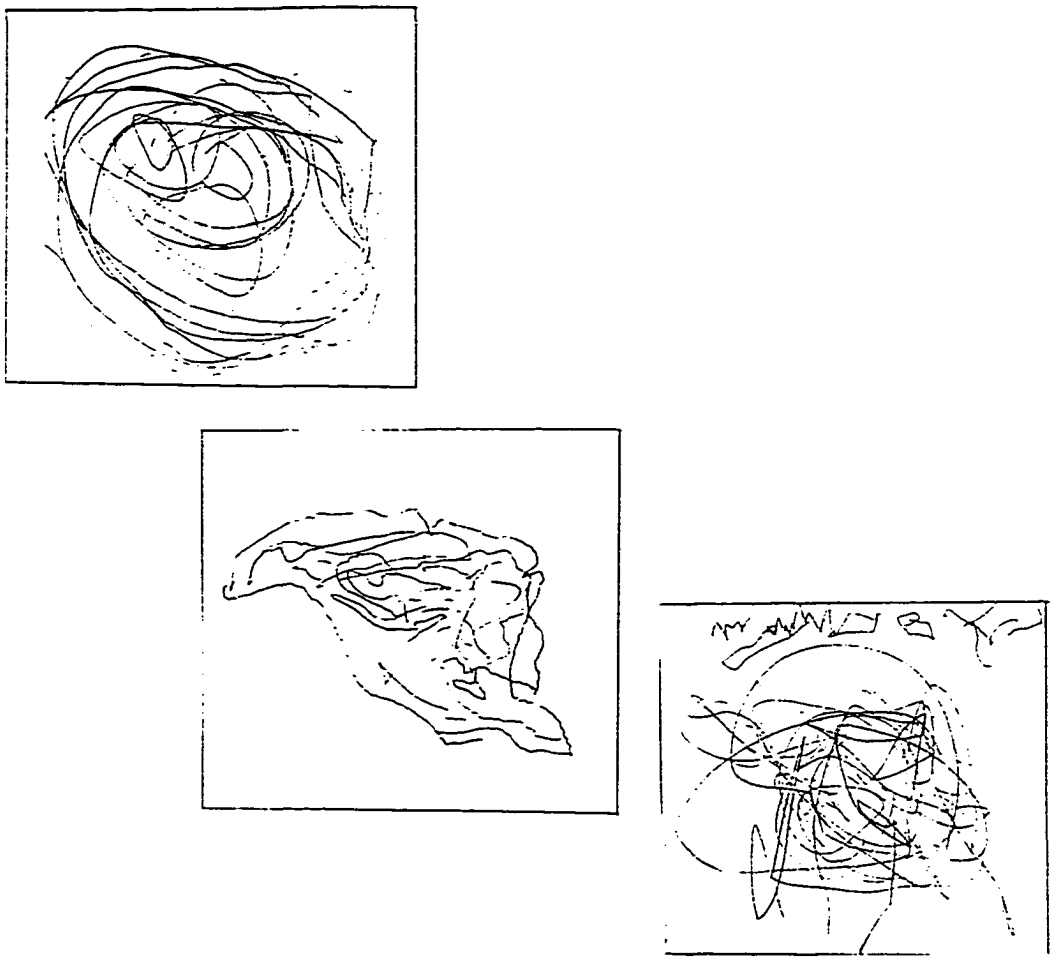


Figure 12. Visual Data: Jack.

pretend continent." Jack becomes very contained. "It is a story about a ghost land... and...if you go there, they will change you into another ghost. It is a story with magic!" He nods his head. "And then...I made another pretend continent!...Can we make a book?" We write out his comments under each map and make a book. He looks at it for a long time.

Descriptive Analysis. This thought process is indicative of dichotomous understanding of the real and the imaginary. He revealed map literacy by knowing the cardinal points, location, place with an understanding of the practical uses of maps (this was the visual analysis). He used linguistic labels to create meaning (this was the verbal analysis). The child's mind is here both concrete: "This is a real world", and abstract: "This is a pretend world". Reality is clearly seen and described: "Cowboys live there"; and the imaginary is clearly seen as a place where the impossible can happen. This thought process is indicative of abstract story shaping and imaginative thought. The drawings are used as tangible links to the imaginary. The maps match well the explanations given by Jack. The map of North America is highly faithful to its true shape (Appendix E).

Visual Data With Commentaries 2

Emilia (four years and six months) [see Figure 13]: Emilia is kneeling on her chair leaning over the table putting stickers, little blue bunnies, on her book. My assistant has already compiled Emilia's work into a book. Emilia still kneeling on her chair hides the book behind her back and beaming from ear to ear instructs me to: "Sit down!" She has a way with words! I sit down. She jumps off her chair and puts the book in my lap with great pride, leans heavily against me and says: "Read it!" We read: "The World, Maps by Emilia." It has two pages with two maps. On the first page: "The World, this is a map of the World, it is for people to go around the world." This map has a circle in pencil, lines of continents and straight lines

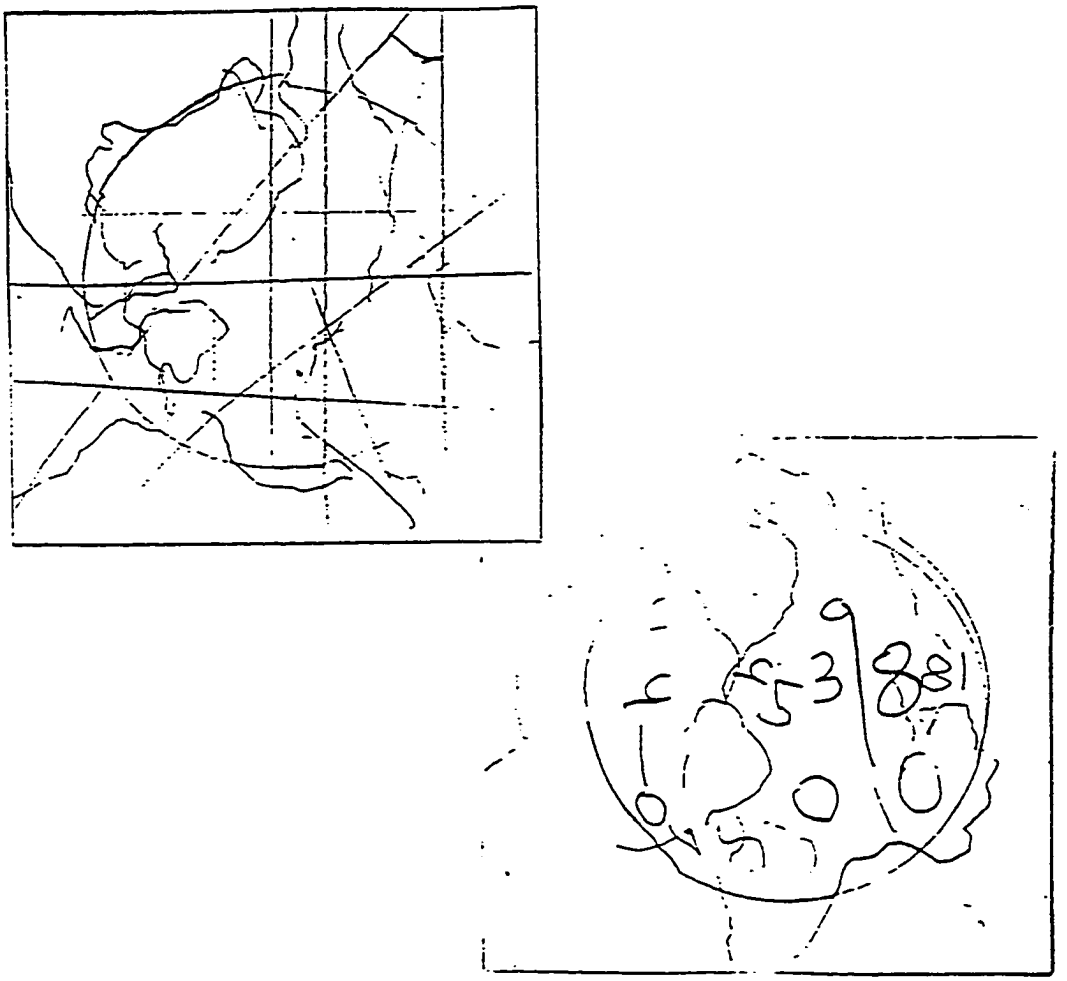


Figure 13. Visual Data: Emilia.

crisscrossing each other. The second map has only numbers on it with shapes of continents. I ask about the lines and numbers, Emilia points to the longitude and latitude lines on the World map next to us on the wall. I ask about who would need those lines. She tells me: "People, in boats, you know, like Marco Polo." At this she wiggles and squirms, she has fallen in love with Marco Polo. "Is this a map for Marco Polo?" Now she giggles: "Yes!" We laugh together. "You like Marco Polo?"

"Yes!" I ask her if she can go and find Marco Polo anywhere in the world. She becomes silent. "In the movie I can...no, not really." I have made her very serious. I regret it. We go find the book on Marco Polo and read it together.

Descriptive Analysis. This thought process is indicative of the knowledge and understanding of the irreversibility of time and the permanence of space. It identifies importance and reveals map literacy. It shows an affective understanding of time and reveals historical literacy in the reference to Marco Polo. The tangible links to space are the maps. The maps clearly depict the world with latitude, longitude, numbers, and lines (Appendix E).

Visual Data With Commentaries 3

Julie (four years and ten months) [see Figure 14]: Julie is very shy. She has made two maps of the world, both are very similar, second one is much better. She shows them to me very proudly and explains her efforts at making a better map. She tells me she didn't like the first one so she made another one. We talk. She knows the names of all the continents, the cardinal points, the oceans, she knows latitude and longitude. She has made the maps using small wooden forms. She knows where Michigan is. Each continent is a different color. On her desk she has arranged sets of pictures according to each continent and so we go through each set. I let her talk. She tells me about mountains, deserts, rain forests, animals and people. She tells me that her favorite time period is the Middle-Ages. She had played the part of a princess

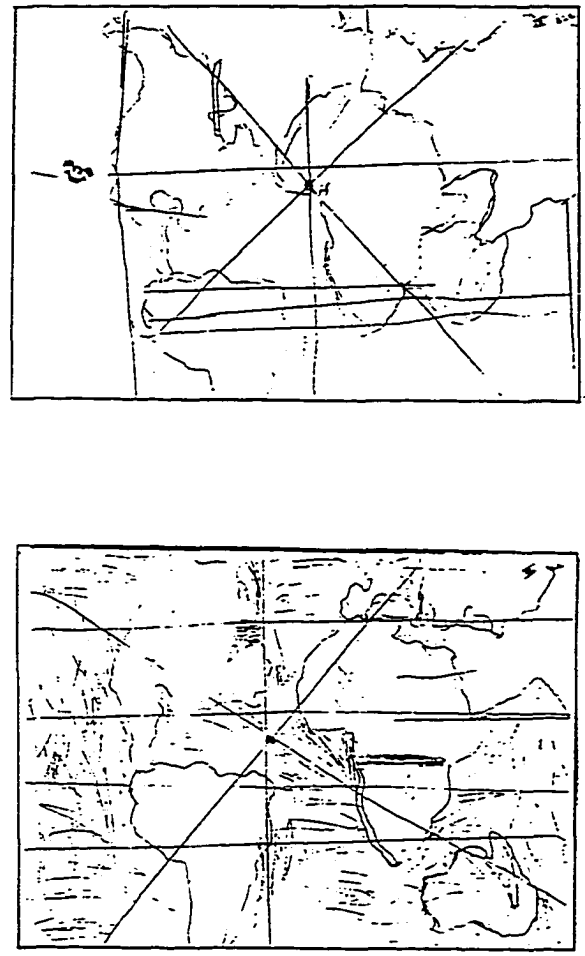


Figure 14. Visual Data: Julie.

in our school pageant. We look at pictures of castles and knights in armor. I ask her if she went to these places would she find the castles, she nods her head, I then ask if she would find the kings and knights. Julie thinks for a while. "I might, but they wouldn't look like these..." she points to the knights in armor. Julie's little sister joins us and the conversation turns to other things.

Descriptive Analysis. This thought process is indicative of the knowledge and understanding of the irreversibility of time and the permanence of space. It reveals geographical literacy and it also identifies the importance of maps by arranging around her map sets of pictures which illustrated the vegetation, fauna, and people of several continents. The maps are clearly those of the world with longitude and latitude. They are very carefully colored. The second map is an improvement upon the mistakes of the first map, indicating a high level of observation (Appendix E).

Visual Data With Commentaries 4

Joseph (four years and ten months) [see Figure 15]: Joseph has finished his map. He has been working on it for 2 days. We sit and marvel about it. The map was done free hand. I ask him if it is a homolographic projection. "Yes, but it is really a picture of the world. I made it because I don't want to forget it. I am going to kindergarten next year, my brother said we wouldn't be talking about the world. I just made a picture of it because I like it a lot!" Later that day he sat with his teacher and told all about dinosaurs, woolly mammoths, whales and all things that are important to him...where he lived, where his father came from, an island in the Caribbean, where his grandparents spent their summers. All the while as he talked he pointed to his map, locating, describing, telling of all the things that he loved.

Descriptive Analysis. This thought process reveals the knowledge and understanding of the remote in both time and space. The map exemplifies his thoughts.

Figure 15. Visual Data: Joseph (Four Years and Ten Months).

The map is beautiful; it is a work of art. It is drawn free-hand; it is a homolographic projection. Joseph states that it is a "picture" of the world, revealing the deep emotions he has for the world. This map is made to remember the world by once he is in kindergarten. He has become attached to geography. It is very important to him. He has entitled the map: "THE WORLD" in eight inch letters. Here we see a pairing of emotions. The world is beautiful but it is also a tool for organizing his thoughts. Art and technology are both part of his understanding of the world which offers permanence but over which time passes. First, he tells us, there were dinosaurs, then woolly mammoths, and finally there is his own young life; his father from an island, his grand-

parents on the Atlantic. Time and space are here well defined. There is historical and geographical literacy, both held with great affection (Appendix E).

Visual Data With Commentaries 5

Joseph (four years and eleven months) [see Figure 16]: Joseph has been working all week on his map. All week people have been coming up to him to admire his work! Today, Friday, 11:15, he announced that he had finished. His work is impressive! He worked on it entirely alone, planning, cutting, pasting, singing. I did not insult him by asking the names of the continents. I did ask him about the little animals surrounding the top of the map. "Those, are dinosaurs! It is a map about when dinosaurs were alive, before they became extinct!" We talk some more. I then ask about his second set of maps, they are very beautiful to look at, so precisely done, each continent against the backdrop of a blue circle symbolizing the Earth. "The green is where the dinosaurs lived. Those are the forests." He had copied physical maps from an atlas. I asked: "Joseph, if we go to these forests will we find dinosaurs?" He is quiet, a little sad; dinosaurs are his passion; he plans on becoming a paleontologist. "No...I wish we could though, don't you?"

Descriptive Analysis. This thought process is indicative of the knowledge and understanding of the permanence of space and the passage of time. The map is very accurate. It is a homolographic projection of the world at a certain point in time: "The map is about when dinosaurs were alive". The map is very important to him for he

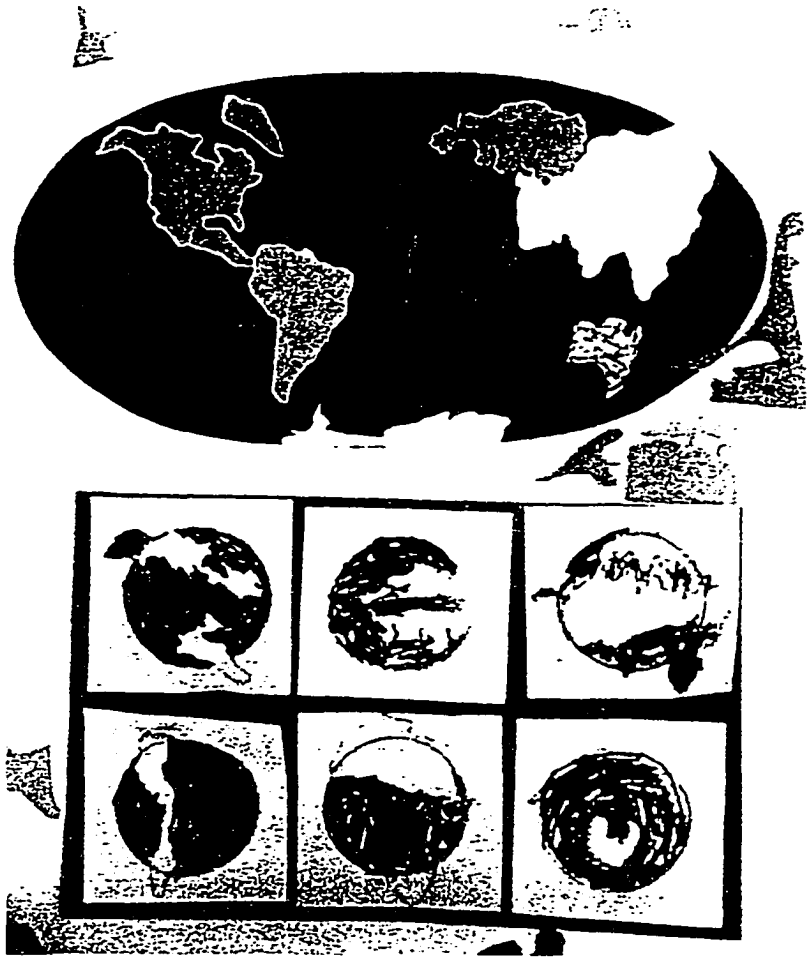


Figure 16. Visual Data: Joseph (Four Years and Eleven Months).

has worked on it alone for five days. There are two renditions of the continents. The second rendition is a metaphor, a way of seeing the roundness of the earth through a more flexible image; the backdrop of each continent is a blue circle. Here we see conceptual growth and a definite ease in the ability to understand geographical concepts linked to historical concepts of time removed.

Interpretive Review of the Descriptive Analysis of the Visual Data With Commentaries

The descriptive analysis of the data of these five visual data with commentaries and the re-contextualized commentaries enabled the researcher to discern a mental construction that held both commonality and uniqueness.

Commonality

Of the five documents reviewed: five revealed dichotomous thought; three an understanding of the permanence of space and the irreversibility of time; five identified the importance of their subject matter through proud behavior, the outstanding quality of their work, and the amount of time which they had spent at their work; five used maps, an object, and/or a person as tangible links to the past, the far away or the imaginary. With regard to these maps: five had map literacy; four knew the names of the continents; three knew the cardinal points; and two knew longitude and latitude. Five had an affective understanding of place and time.

Uniqueness

Through the analysis of the five visual data documents with commentaries, the uniqueness of metaphor in the thought process was revealed: James interpreted through an artistic rendition of the continents a sense of the roundness of the earth; one had an understanding of the imaginary versus reality.

Conclusive Interpretation of Analysis I and Analysis II

Children during their fourth year of life, with the experience of a specially designed curriculum, are able to apply intuitive sensitivity or intuition to constructing accurate ideas of both time and space.

Survey

The survey was administered three years later.

Purpose

The purpose of the survey was to determine if the sample children, who during their fourth year of life experienced a specially designed curriculum, constructed accurate ideas of distant space and time.

The survey data and the interpretations of the survey are presented through an evaluative analysis of the interviews with the children. They are presented in four categories:

1. Category 1A includes space-geography attributes and an evaluative analysis of the child interviews.
2. Category 1B includes time-history attributes with the parents.
3. Category 2A includes an evaluative analysis of the child interviews.
4. Category 2B includes time-history attributes with the parents.

A comparison between interviews 1A and 1B and 2A and 2B is presented next, followed by a comparison between the maps drawn by the children and the maps drawn by the parents.

Evaluative Analysis

Category 1A: Space-Geography Attributes/Child Interviews

All seven children appeared eager to respond, perhaps remembering that the experiences with social studies in pre-school were pleasurable to them, as well as the joy of reestablishing contact with their prior school principal. They showed excitement through their smiles, wiggles, and hurried speech. Their most vivid memory was making maps of the world. Of the seven, four indicated that their best maps were framed and put up in their bedrooms. Next, they all recalled the royal pageant, preparing for it, making banners and castles, and the roles which they played, who was king or queen, court jester or knight (Appendix B).

All made accurate maps. They knew the cardinal points, names of the continents, and location of the equator. Six said they really liked maps. One said she preferred the globe. They all were able to locate towns and, although only five were familiar with the term "environment," they all were categorical about taking care of the earth. They all liked to travel and to find not only new places, but different people and how they lived. Two had been abroad to Japan and to Canada. All indicated that they really wanted to visit other countries. All had foreign friends and could locate

them on the map. All indicated that when people are different it is "interesting". When asked what kind of things could be different, they answered: "language... religion...the food people like...the way they dress". One mentioned that one could be different within one's own culture, such as a crippled friend. They no longer used linguistic labels to describe the geographically distant. The children used numeric terms, both cardinal and ordinal, laced with the terms "years" and "miles."

Category 1B: Space-Geography Attributes/Parent Interviews

The answers of the seven parents tended to be more positive while closely reflecting their children's answers. Of the seven, five were reticent when asked to draw a map of the world. Two made maps and five knew all their continents. They all indicated that their children knew or could find countries that were mentioned either in conversation or on television, and two indicated that when there was doubt as to where a country was, the members of the family turned to their child. Two of the seven indicated that their children were very positive and accepting of differences between cultures. This was particularly strong in their school setting and reported by their teachers

The interview responses suggest that the goals of the specially designed social studies curriculum which these children had experienced three years earlier was still clearly remembered and that their constructs of space were reflected in positive dispositions to geography.

Category 2A: Time-History Attributes/Child Interviews

All seven children liked stories about long ago, and three said that it was "like going there". Their interests appeared to rest either in the remote past such as pre-history or in medieval times for three of the seven. Their favorite people were: Elizabeth the First liked by one, Helen Keller liked by two, George Washington liked by one, and one liked Ronald Reagan "but he wasn't dead yet, so he didn't count". Famous groups were Native Americans for two of the seven, medieval people for two, and cave-people for two, and ancient Greeks for one.

Architecture was considered important. One child explained that "it tells us about the past...it speaks to the heart". This was Emilia, who still had a way with words! All liked museums. Three of the seven liked to find things from a long time ago, two liked to find things from other countries, one liked to play with artifacts, six remembered the term artifact, and four added that they had collections of "arrow heads...fossils...shells...and Indian things". Of the seven, two had an interest in foreign music. One indicated that she might become an opera singer, but she also would like to be a marine biologist or an archeologist. She could not make up her mind. Six of the seven had strengths in school. Two were strong in social studies, two in language, one in math, one in science. When asked what they would like to be when grown: one suggested a librarian, one a teacher, two planned to be archaeologists, one an opera singer, an archeologist, or a marine biologist, one a marine biologist, one wanted to be an architect. From these interviews it appeared that the children still held an avid

interest in things from the past. They were able to discuss preferences on time periods and people within these time periods. All had definite plans about their adult professions and they were embracing the future. One of them wanted to go to Greece to see Greek temples. They no longer used linguistic labels to describe the historically distant. Numeric terms were used, both ordinal and cardinal.

Category 2B: Time-History Attributes/Parent Interviews

Although the answers from the seven parents were more enthusiastic, they did largely reflect the children's answers. All concurred that the social studies program which their children had experienced in school as a four year old had left a lasting impression, such as an enhanced interest in geography which was beyond their years. The parents also saw interests which they could not explain as part of a family trait or characteristic, such as one child who liked to read stories based on historical facts, another who had become interested in her Native American ancestry although this has not been particularly encouraged at home. Still another had a fascination with fossils and things found in the ground that "speak of the past". All parents were proud of how their children valued "people". Were these behaviors resulting from their early social studies curriculum at the age of four years, or did it result from parental models or a combination of the two?

Comparative Graph of the Answers of the Children With Those of the Parents

Space-Geography Interviews 1A and 1B

The answers of the children when compared to those of the parents show little discrepancy (Figure 17). The interviews were conducted so that the parents and child could see each other, but not hear each other. This assures the authenticity of the answers by the children. Question six shows that the children had greater map literacy than their parents. Two parents agreed to make maps; all the children made maps. The maps drawn by the children are more accurate than the maps drawn by the parents. The children have stronger map literacy than the parents. The children's maps are homolographic projections with the cardinal points correctly aligned, the continents have recognizable shapes. These five constructs of map usage suggest that the specially designed social studies curriculum experienced at the age of four had influenced their geographical thinking (Figure 18).

Time-History Interviews 2A and 2B

The answers from the independent interviews in time-history with the children and the parents show few discrepancies (Figure 19). Parents show greater enthusiasm for their children's strengths and accomplishments in school (questions 9 and 10), but have less knowledge of their children's ability to name famous people. Parents in general were quite positive about their children's abilities to look at different time periods and to be able to discuss them.

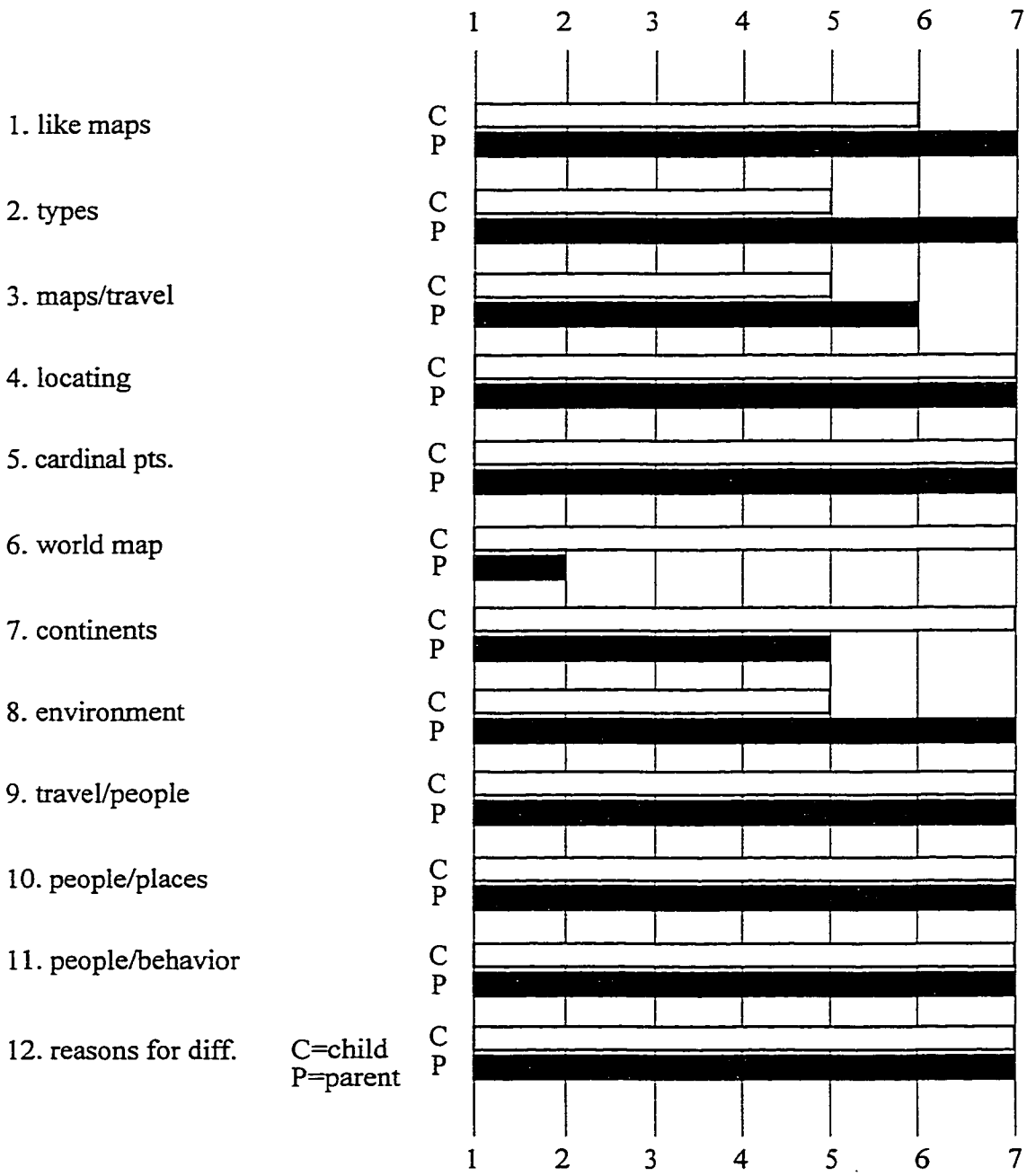


Figure 17. Space/Geography/Attributes 1 A and B: Answer Comparison Between Child and Parent.

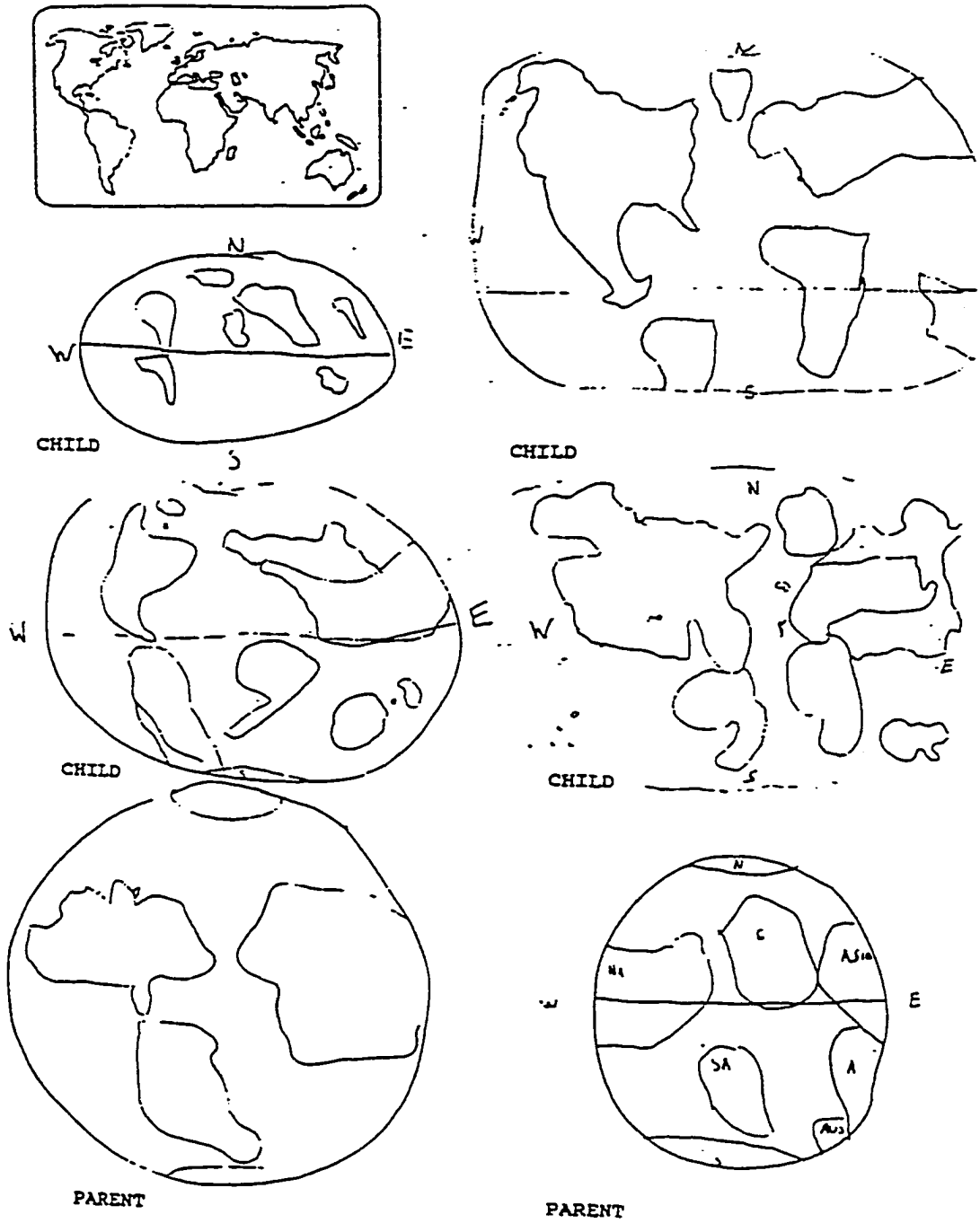


Figure 18. Maps Made by the Children and the Parents.

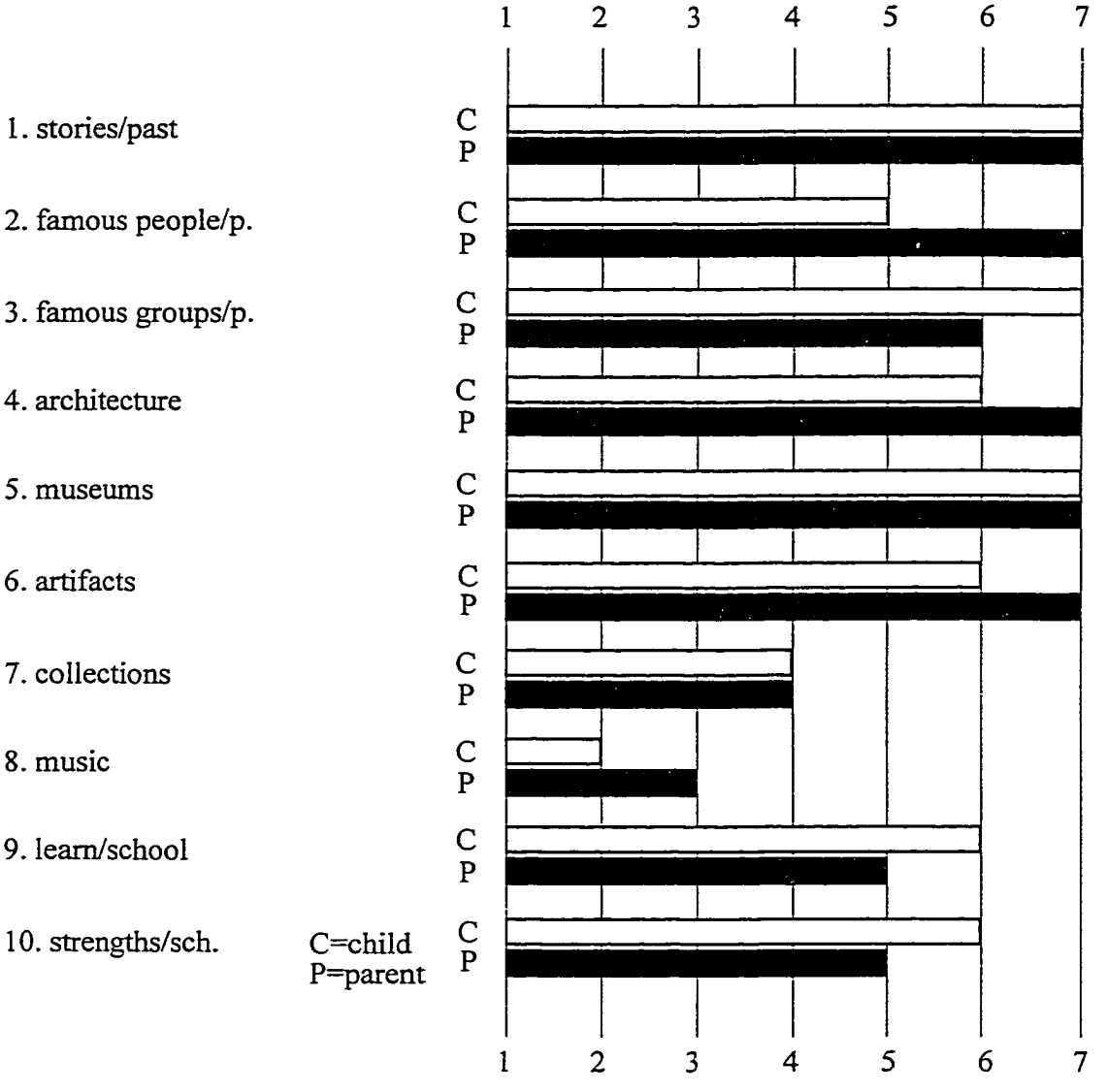


Figure 19. Time-History/Attributes 2 A and B: Answer Comparison Between Child and Parent.

Findings of the Survey

The answers given by the children established that three years after they had been given instruction in the specially designed social studies curriculum, they retained constructions and conceptualization of the shape of the earth, and of the continents, the cardinal points and the equator. Their interest in geography had not lessened. In fact, it appeared to have grown. The children were looked up to by their families for being knowledgeable in world geography, an ability which parents suggested was beyond their children's years.

Their interest in history was equally strong. Their thoughts turned easily to the distant past, placing groups of people at different spans of time, discussing preferences for one period of history over the other, looking at architecture with interest, knowing the value of things of the past. This latter point was suggested in Emilia's statement: "They speak to the heart".

The permanence of space and the irreversibility of time at this age was formed by the age of seven with the children. They understood the concepts and mediated them with many attributes, filling the dualities encountered, broadening their knowledge, developing many interests. Space and time had become geography and history. Linguistic labels to describe the remoteness of time and space were no longer used. The findings from the questionnaire indicate a clear understanding of world geography and historical thought. The findings indicate that the intuitive sensitivity to time and space observed among the children at the age of approximately four years was no

longer present.

Conclusive Interpretation

The sample of children who, during their fourth year of life, experienced a specially designed curriculum, and who were able to apply intuitive sensitivity to constructing accurate ideas of space and time, developed lasting interests in history and geography.

Summary of the Findings

Figures 20 and 21 present a comparative summary of the children's conceptualization of time and space at the age of four and then at the age of seven. The figures indicate similar fluctuations of thoughts and patterns of interests for all the children. Prominent at the age of four is dichotomous thought and intuitive sensitivity, imbued with affective forms of interest in space and time. Prominent at the age of seven is the ability to construct relationships between concepts through the use of attributes. Affective conceptualization of time and space has shifted to more varied interests: for different versions of the past, present, future, and the utility of maps. Of interest is a lessened ability to reproduce the world and its continents as faithfully as they did at the age of four. The "First Frontier" while being experienced may have allowed the children to draw accurate maps of the world through their everyday practice.

An array of mediating attributes which the children now clustered around space and time allowed for a broader understanding of, and varied forms of interest, in

Time

Child:	Ages	1	2	3	4	5	6	7	8	9	
Emilia	4	+++	+++	++	+++	+++	+	+	+++		O
	7	+		+++		+++	+++	+++		+++	S
Lillian	4	+++	+++	++	+++	+	+	+	+++		
	7	+		+++		++	++	+++	+	+++	
Arielle	4	+++	+++	++	+	++		++	++		
	7			+++		+++	+++	+++	+	+++	
Louis	4	++	+++	+++	++	+++		++	+++		
	7	no interview									
Joseph	4	+++	+++	+++	+++	++		++	+++		
	7			+++		+++	+++	+++	+	+++	
James	4	+++	+++	++	+++	+++	++	++	+++		
	7			+++		+++	+++	+++	+	+++	
Jack	4	was not preoccupied with time									
	7			+++		+++	+++	+++		+++	
Julie	4	+++	+++	+++	+++	+	+	+	+++		
	7			+++		+++	+++	+++		+++	

O:observations
S: survey

"+," "++," "+++," indicate a weak (+) to a strong (+++) presence of an ability, characteristic

1. Dichotomous thought
2. Intuitive conceptualization of time
3. Mediating concepts
4. Time conceptualized through the use of linguistic labels
5. Sense of chronology
6. At ease with different versions of the past
7. Construction of relationship through the use of attributes
8. Affective conceptualization of time
9. Time as history

Figure 20. Time. Comparative Summary of Analysis I, Analysis II, and Survey.

Space

Child:	Ages	1	2	3	4	5	6	7	8	9	
Emilia	4	+++	+++	+	+++	+++	+++	+	+++		O
	7	+		+++		++	++	+++	——	+++	S
Lillian	4	+++	+++	+	+++	——	——	+	+++		
	7	+	+	+++		——	——	+++		+++	
Arielle	4	+++	+++	+++	+++	——	——	+	+++		
	7	+		+++				+++		+++	
Louis	4	+++	+++	++	+++	——	——	+	+++		
	7	no interview									
Joseph	4	+++	+++	++	+++	+++	+++	++	+++		
	7	+		+++		+	+	+++		+++	
James	4	+++	+++	+	+++	——	——	++	+++		
	7			+++		——	——	+++		+++	
Jack	4	+++	+++	+++	+++	++	——	++	+++		
	7	++		+++		+	+	+++		+++	
Julie	4	+++	+++	+	+++	+++	+++	+	+++		
	7	+		+++		+	+	+++		+++	

O:observations
S: survey

"+," "++," "+++," indicate a weak (+) to a strong (+++) presence of an ability, characteristic

1. Dichotomous thought
2. Intuitive conceptualization of space
3. Mediating concepts
4. Space conceptualized through the use of linguistic labels
5. Accuracy of the shapes of continents
6. Accuracy of the placement of the continents
7. Construction of relationship through the use of attributes
8. Affective conceptualization of space
9. Space as geography

Figure 21. Space. Comparative Summary of Analysis I, Analysis II, and Survey.

history and geography. The "First Frontier" experience may have offered the children a framework on which to sort and classify mediating concepts or attributes of time and space which had emerged between the ages of four and seven.

CHAPTER V

CONCLUSIONS AND INTERPRETATIONS

This study demonstrated that children at the age of four are intuitively sensitive to space and time. The constructed concepts of space and time persisted and developed in a sample of children, and were reaffirmed at the age of seven years. The space and time dichotomy of their world was grasped through reflections and behaviors that suggested interconnectedness of both the material and the spiritual attributes. While not conclusive from the study, the researcher postulates that the children developed a lasting understanding of history and geography.

The findings of this study provide evidence that the children in the sample constructed an intuitive understanding of both time and space. The results of the study suggest that children about the age of four have the following constructs of time and space:

1. They are intuitive, finding meaning in their world view.
2. They have metaphysical concerns, looking for both the nature and the reason of things.
3. They sense the dichotomies of reality, looking at reality from its extremes.
4. They are able to mediate between the dualities found.
5. They have knowledge of death.
6. They seek the origins of life.

7. They use linguistic labels in order to create meaning.

8. They are able to use objects as tangible links to the past, the future, the physically remote, or the imaginary.

9. They are able to discern the importance of the concepts of time and space.

10. They become affectively involved with the concepts of time and space.

11. They have knowledge of the irreversibility of time.

12. They have knowledge of the permanence of space.

The study developed over a period of seven years. It was an outgrowth of the researcher's interests in offering children what they needed intellectually at the right time in their lives.

The setting and the curriculum used in this research was planned by the author. The children were observed while involved in activities they really liked in a serene environment. This was probably helpful to the outcome of this study since it eliminated many interfering factors. The specially designed curriculum in its implementation capitalized strongly on the children's emerging sense of space and time.

Not considered in this study were the Montessori sensorial materials which help young children in discriminating between colors, shapes and textures. These experiences could have influenced the perceptual abilities of children in the sample and may have helped in the creation of maps. Also the parents were very supportive of the social studies program. Therefore it is possible that the physical environment, the sensorial material, and the involvement of parents could have contributed to the outcome of this study by providing a zone of proximal development (Vygotsky,

1978), and probably should be further explored. Further research should examine these effects for they could be used in the teaching process at that age level.

The sample used in the study was small. An optimal environment and curriculum was used which allowed for the possibility of the understanding of time and space to occur. The familiarity of the researcher with action research was a strength. Data collection procedures, the use of different forms of analysis, and the careful scrutiny of the findings resulted in a reliable and credible research study.

This study reaffirms that young children are very capable and insightful. It adds to the current research the evidence that children at an early age are able to construct both mental and visual maps which reflect spatial construction of reality. They are able to construct the temporal elements of time both with a personal reference as well as distant past and near future. Children acquire and utilize an extended vocabulary allowing them to freely express their thoughts in reference to space and time.

The abilities and thought patterns in young children's dealings with space and time which are the findings of this study are in agreement with respected experts in the field of geography (Blaut, 1974; Castner, 1990; Downs & Liben, 1997; Norton, 1989; Stea, 1974), history (Poster, 1973) and education (Bettleheim, 1977; Bruner, 1963; Egan, 1997). In relation to the theories offered by Kant (Goldman, 1974) and Hegel (1956) the results of the study place the first occurrence of the knowledge of reality during the fourth year of life. The combined results of the present research and past research bring into question the traditional expanding environment curriculum used in most schools.

In relation to Piaget's theory of development, the findings of this study are in agreement with the age at which children understand history and geography, but differ in that instruction on history and geography was given at a time of development when thoughts on time and space were in the process of maturing. Yet the children were not harmed by early instruction–in fact they thrived.

The theory and research procedures in this study are in complete agreement with the Vygotskyan psychological theory that "only good learning is that which is in advance of development...that what is in the zone of proximal today (in this case at the age of four) will be the actual development level tomorrow" (Vygotsky, 1978, p. 87). Therefore intuitive sensitivity to time and space at the age of four is in the zone of proximal development. To offer instruction on history and geography at the phase of intuitive sensitivity to time and space, when thoughts on time and space are in the process of maturing, fosters good learning because it is in advance of development.

Stoltman (1991) has pointed out that research addressing questions of what children do or can do with regard to spatial and temporal concepts at an early age has been neglected in the United States. There is urgency in addressing this issue. Continued research in the vain of the present study would allow the educational community to develop early instruction that applies and enhances children's construction of space and time. When young children find themselves in a period of intuitive sensitivity to space and time, a period in which they grasp the duality of the spatial and the temporal, they have access to a holistic perception of reality. This might be a crucial moment in which to start education of the whole, of the interconnectedness of all

things.

It is important to remember that as young children grow to adulthood they will find a world that now embraces systems thinking (Capra, 1988; Senge, 1990). Systems thinking looks at the interconnectedness of time and space as well as other spheres of reality. A symbiosis of all things, both human and nature, and their interactions and interconnections across time and space that begin at basic levels in early life, and then move to more complex levels (Cain, 1999; Capra, 1994). Systems thinking in adulthood involves comprehending both problems and solutions. It emphasized the importance of knowledge, information, and therefore education. It offers a powerful way to look at the world; a way that can promote effective and responsible behavior (Laszlo, Artignani, Combs, and Czanyi, 1996; Lewis, 1998). This implies a reformulation of instruction and education offering a holistic vision of reality.

With this in mind, early exposure to educational programs designed to help young minds to embrace the emerging systems view, would permit for the development of cognitive maps or mentalities in harmony with the holistic view of life. Allowing young children to contemplate the beautiful multiplicity of who we are, living our own ways in wondrous varieties of landscapes, would surely prevent misconceptions about life and the world that often lead to stereotypical attitudes. Introduction to the disciplines of geography and history at the onset of the period of sensitivity to time and space would allow children from a very young age to think geographically and historically. Such a turn of thought would certainly enhance children's ability to sort and classify information, and ultimately to think critically.

The results of this study are consistent with the thesis statement that children, during their fourth year of life, construct representations of time and space using "intuitive sensitivity", or intuition. The effects of a specially designed curriculum may have enhanced these constructions, but the data from the study do not permit direct affirmation of those effects.

The study offers a basis from which to continue further investigation into the nature, the limits, the extent and the boundaries of young children's understanding of space and time. Equally important are the conditions under which this knowledge may occur and develop. These are questions concerning the epistemology of young children's time and space constructs which are in need of further inquiry.

Conclusive Thoughts

If this research project were to be repeated what would be different or stay the same? Differently, based on Vygotsky's theory that we can predict what will happen to children between the ages of five and seven provided the same developmental conditions are maintained, the same sample children would stay within an optimal environment and curriculum experience from the age of four until the age of seven. At the age of seven the sample children would be compared to a sample of children who had not gone through the same experiences but had instead received instruction according to Piaget's theory of development and instruction. This would determine the mental age (this being functions that have matured, the researcher having a summary of completed development) [Vygotsky, 1978, p. 87] of both groups of

children. Since both groups would have received instruction in two different methods, this procedure would determine the effectiveness of teaching history and geography while the children were in the zone of proximal development to time and space, or period of sensitivity to time and space at the age of four.

What would be done the same would be the physical environment, the special curriculum, and the methods of observation and analysis.

Recommendations to the Geography and History Communities

1. Put the children in an environment that they can work and feel comfortable in–a place where they can talk and share and laugh.

2. Always remember that at the moment of sensitivity to time and space at the age of four, the instruction of history and geography are intricately interwoven and therefore should be offered together.

3. Start from the universe, the whole, from the heavens. It is important to pay attention to the alternating patterns in their lives, such as day and night, seasons of growth and decay. "The First Frontier" curriculum in Appendix F offers a good plan.

4. Both disciplines should be presented in a meaningful way to the children, periodically evolving into a complex cultural activity, such as preparing and performing a medieval pageant. A sense of play should be aroused, such as James wishing to re-enact a Greek myth since he could not return in time to find the people of Knossos. The program should arouse intrinsic motivation and never be imposed, subject matter should have some relevancy to their lives.

5. Move around the world by following the connected threads of history. For instance, go to Asia with Marco Polo, come back with him and enter the Renaissance period in Italy, find another explorer (or movement of people), go somewhere else. Always follow the advance of time.

6. Materials which are developed should be appealing to the children, using colors that they like and also textures. Colors should be uniform, tints not shades.

7. Describe the landscape, the weather, the vegetation, animals, and then the people and how they live their lives. Issues of the National Geographic Society have many beautiful photographs to mount, color code and laminate.

8. Use dual coding.

9. Offer artifacts, art, music, sounds of where you are in the world: the oceans, winter storms, wolves on the tundra, lonely places, busy places, beautiful places.

10. Invite people who will play roles, such as a musician dressed as a troubadour when you are in medieval times.

11. Always keep the materials you use for your presentations in the classroom so that the children can go and re-visit them.

12. Above all enjoy what you are offering the children--teach with passion. They will catch from you the sense of wonder and importance due our world and its people.

Appendix A

Further Information on the School

INFORMATION ABOUT THE SCHOOL IN WHICH THE STUDY WAS CONDUCTED

The school was accredited by the AMI Association, which is the International Montessori Association (Associazione Montessoriani Internazionale) in the United States, and the State of Michigan. Twenty five to thirty students were enrolled at a time. Class sessions never held more than eighteen children. The children were between the ages of three and six. The curriculum taught was for pre-school and kindergarten according to the Montessori method. The school was equipped with all the Montessori apparatus. The ratio of adults per child was nine. Two teachers, assistants, usually students doing their pre-internships or practice teaching from the local university and one or two parents were always present. The personnel had public school teaching certificates. The school had two classrooms, an entrance area and a large hall. The grounds were spacious. Fields on all sides ran to wooded areas. The children had wooden play-ground equipment, with a tower, swings, slide and sand box. Parents were pleased with the school setting, classrooms, curriculum and personnel. The personnel were involved in and content with the functioning of the school.

The principal /owner of the school held a pre-school diploma from the AMI training center in Perugia, Italy, and an elementary diploma from the AMI training center in Bergamo, Italy. Mario Montessori, the son of Maria Montessori lectured on the Montessori philosophy in Bergamo. The researcher was the principal of the

school and held a masters degree in early childhood education and had studied in France, Italy, and England. The principal made all the educational and financial decisions.

Appendix B

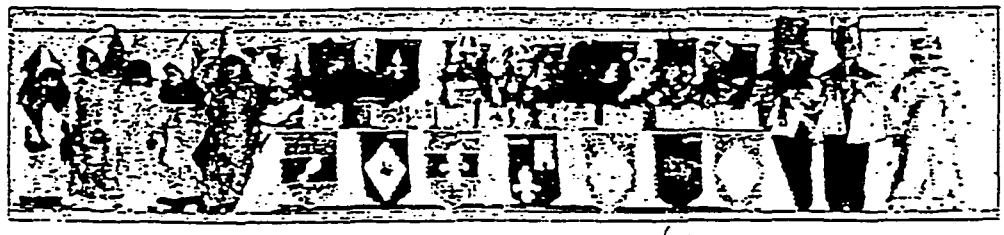
Curriculum Sample

Hear Ye! Hear Ye!

Thou art bidden to attend and be present
at the Ceremonies of Knighthood for the realm.

Dubbing of Knights to be celebrated
at 10:00 in the morning
on Friday, April the 12th
the year 1991 Anno Domini

The Royal Victualler to provide a
light repast at the conclusion.



Appendix C

Human Subjects Institutional Review
Board Protocol Approval

Human Subjects Institutional Review Board

Kalamazoo, Michigan 49008-3899

WESTERN MICHIGAN UNIVERSITY

Date: 3 November 1998

To: Uldis Smidchens, Principal Investigator
Josephine Barry-Davis, Student Investigator for dissertation

From: Sylvia Culp, Chair Sylvia Culp

Re: HSIRB Project Number 98-09-15

This letter will serve as confirmation that your research project entitled "A Theory of Thought on Time and Place at the Age of Four and the Effects of a Prescriptive Curriculum" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note that you may **only** conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: 3 November 1999

Appendix D

Analysis I

OBSERVATION CONTEXT:1

Emilia: 4 years and 4 months.

A frosty morning. White shadows linger at the edges of the playground. The children are in their usual throes of jocund hilarity. Emilia shivers toward. "I'm cold" I open the flaps of my coat and we huddle. I smile down at her. She looks past me and a finger shoots out from under her chin. "Look! the moon!...it's still there...it's very very far away...I saw it last night, did you?". Silence. "When I grow up, I will always see it, do you?...When people die they don't see it...I'm not going to die for a long, long, LONG time!". Emilia shivers and shakes her head emphatically. Silence. "Why is it?.. You know, the moon?". A swarm of screaming children run by. With a backward smile Emilia bounces back into the immediacy of her life.

DE-CONTEXTUALIZED ANALYSIS:

(1) OBSERVATION: 1. Emilia: 4 years and 4 months.

Look the moon ...
Pragmatic anaphor

a finger shoots out from under her chin ...
Location: an invitation to locate an object

It's still there ...
Space: spatial permanence/location

It is very very ...
linguistic label: creating meaning

far away ...
Space/location/permanence/vastness of space

I saw it last night ...
Time: temporal change, the past.

Did you? ...
Different reference frame: you.

When I grow up ...
Time: temporal change, the future.

I will always see it ...
Space and time!

do you ? ...
Different reference frame: you.

When people die ...
Ending of life/Knowledge of death.
Event in time

they don't see it ...
Difference reference frame: they.

I'm not going to die ...
Event: knowledge of death/temporal change/future.

for a long, long LONG time ...
Linguistic label/time removed/creating meaning.
Vastness of space

Why is it? ...
Metaphysical question: why? Nature and reason of moon. Quest for knowledge. Question uni

RE-CONTEXTUALIZED ANALYSIS

(1) OBSERVATION 1: Emilia: 4 years and 4 months old

Category: TIME

I saw it last night ...
Time, temporal change, the past

When I grow up ...
Time, temporal change, the future

I will always see it ...
Time and space. The future

When people die ...
Ending of life. Knowledge of death. Event

I'm not going to die ...
Event. temporal change: the future. Knowledge of death.

for a long, long, LONG time ...
Linguini label/time removed/creating meaning Vastness of time.

Why is it ...
Metaphysical question: Why? Nature and reason of moon. Question universal in nature: whole to the parts.

Category: SPACE

Look the moon ...
Pragmatic anaphor

a finger shoots out from under her chin...
Location: an invitation to locate an object

It's still there ...
Space: spatial permanence/ location

It is very, very far away ...
Linguistic label: creating meaning/space/ location/permanence/vastness of space

I will always see it ...

Space and time!/location/place

OBSERVATION CONTEXT:2

Lillian: 3 years and 10 months

Lillian is drawing a picture of a pyramid. The angle of the perspective is very unusual. It is from above, a bird's-eye view. I crouch beside her. She smiles shyly. "This is my pyramid". I smile back. I ask if she wants to tell me about it. She looks at me for a while. "Well, deep, deep inside there..." She puts her finger on the drawing and then puts her face very close to her finger. "...there is a MUMMY". She says the last word in a whisper and silence follows. "...and out of this mummy comes this thing with wings..." She pauses and looks at me and in a normal voice asks: "What do you call this thing?" I tell her. She looks at me, doesn't repeat the word but asks: "Do we have one of those?" Before I could answer she tells me that she thinks that it is a ghost, she nods affirmatively and continues. "This thing..it is flying up here..." She puts her hand above the pyramid to show me. I ask her if she thinks the people who built the pyramids are still there, would she find these people if she went there? A big smile sweeps over her face: "Mrs Davis!!! They are all mummies! They died! They died a long, long, LONG time ago!" I nod, we smile. "I'm going to finish my pyramid now, O.K?" I am dismissed.

DE-CONTEXTUALIZED ANALYSIS

(1) OBSERVATION: 2. Lillian: 3 years and 10 months

This is my pyramid ...
Location: an invitation to look at her work.

deep, deep inside there ...

Linguistic label creating meaning.
Space/place/location

what do you call this thing?...
Quest for knowledge.

it is a ghost ...
Neither life nor death: mediative thought process.

do we have one of those? ...
Different reference frame: we. It is also a quest for knowledge. Holds element of generalizability. An indication of logical thinking. A shift from concrete toward abstract thought.

They died ...
Event in time. Knowledge of death

They died a long, long time ago ...
Linguistic label creating meaning. Time removed. Awareness of permanence of space and irre

RE-CONTEXTUALIZED ANALYSIS

(1) OBSERVATION: 2. Lillian: 3 years and ten months

Category: TIME

They died ...
Event in time. Knowledge of death.

They died a long, long time ago ...
Time removed
Linguistic label
Awareness of permanence of space and irreversibility of time.

it is a ghost ...
Mediative thought process: neither life nor death

Category: SPACE

This is my pyramid ...
Location: an invitation to look at her work

deep, deep inside there ...
Linguistic label: creating meaning
space/place/location-

Do we have one of those?...
Difference reference frame: we
It is also a quest for knowledge.
Holds elements of generalizability
A shift from concrete to abstract thought.

OBSERVATION CONTEXT:3

Arielle: 4.0 years
Louis: Not quite 5
Joseph: Not quite 5

Arielle and Louis are sitting side by side at a table. Arielle is leafing through a storybook on Hopi Indians. Louis is coloring a map of Africa. He has taken all the green pencils in the classroom. After some noisy leafing through the book Arielle declares: "That's where I come from: the sun! Louis, listen to me, Louis do you want to know where I come from?...First I was in heaven, then the rays of the sun and God made me the way I am, put me in my mother's tummy and.." Louis interrupts her..."There is no heaven, just clouds and you didn't come from your mother's stomach because then she was a little girl"...He pauses for a while..."I come from Africa!". Arielle looks at him sideways. He continues: "...where my mommy comes from and my mommy's mommy and my daddy's daddy and there was forever"...He says the last words very slowly, Arielle hasn't moved, he is silent for a while, still looking at his map he says:" I guess they came from heaven, or the clouds..." He thinks for a moment longer. Joseph who was working close by turns to Louis: "Louis, I think you come from Borgess Hospital, that's where I come from"...Two children interrupt the scene by reclaiming the green pencils...

DE-CONTEXTUALIZED ANALYSIS

(1) OBSERVATION: 3. Arielle: 4 years.
Louis: not quite 5
Joseph: not quite 5

Do you want to know where I come from? ...
Identifying importance. An invitation to listen. Time/origins of life?

heaven...rays of the sun...God ...
Location: heaven
Origins of life
Metaphysical dawning: not a biological question. "How" are the rays, why is "God".

Just clouds ...
Location: clouds

I come from Africa! ...
Map literacy/Location
Tangible link: to his past generations

Where my mommy comes from and my mommy's mommy and my daddy's daddy...

Origins of life
Events in time: knowledge of continuity of time

and there was forever ...
Space and time!
Knowledge of continuity of time
Identifying importance: creating meaning

I guess they came from heaven...or the clouds ...
Time and space/location
Metaphysical concerns

I come from Borgess Hospital ...
Place. Pragmatism/immediate reality

RE-CONTEXTUALIZED ANALYSIS

(1) OBSERVATION: 3. Arielle, Louis, Joseph

Category: TIME

Do you want to know where I come from?
- Time/origins of life
- An invitation to listen
- Identifying importance

heaven...rays of the sun...God...
- Location: heaven
- Origins of life
- Metaphysical dawning: not a biological question
- "How" are the rays, and why is God?".

Where my mommy comes from and my mommy's mommy and my daddy's daddy...
- Origins of life
- Events in time: Knowledge of continuity of time

Category: SPACE

Just clouds ...
- Location: clouds

I come from Borgess Hospital
- Place. Pragmatism/immediate reality

TIME and SPACE

I come from Africa ...
- Map literacy
- Tangible link: to his past generations

And there is forever ...
- Space and time!
- Knowledge of continuity of time
- Permanence of space

I guess I come from heaven... or the clouds ...
- Time and space/location
- Metaphysical concerns

OBSERVATION CONTEXT:4

James: 4 years and 11 months.

All the children have either gone outside or into the playroom. James is turning the pages of a large book; Peoples and Places of the Past, National Geographic. I walk toward him and kneel close to him. He is looking at Knossos and the frescoes on the walls of the palace. "Mrs Davis, don't you wish you could go there? I wish I could go there!" I suggest that he can go there someday. He shakes his head. "No, it won't be the same, because the people won't be there, they are all dead! I want to talk to them don't you?" I nod my head, he continues. "I can see the buildings if I go there, but I want to talk to the people who built them..." Heavy sigh. " I wish I could go there..." Since the classroom is now empty I suggest that he can take the book into the playroom. He looks up, shakes his head and then with one last look at the book dashes into the playroom. As I close the classroom door I hear James' voice, strong, clear, commanding: "Let's play Persephone! I'll be Hades, Arielle you be Persephone, Kelly you be Demeter..."

DE-CONTEXTUALIZED ANALYSIS

(1) OBSERVATION: 4. James: 4 years and 11 months.

He is looking at Knossos and the frescoes on the walls of the palace ...
Tangible link: images of the past

Don't you wish you could go there? ...
Time and space.
Different reference frame
Affective understanding
Invitation to discuss the topic.

I wish I could go there ...
Time and space
Affective understanding

It won't be the same! ...
Time and space. Time as temporal change: the past.

because the people are all dead! ...
Knowledge of death
Time and space.
Time: past event. Irreversibility of time
Affective understanding

I want to talk to them ...
Time: present and past. Irreversibility.
Affective understanding

I wish I could go there ...
Time and space
Affective understanding of time and place.
Irreversibility of time.

Let's play Persephone ...
Tangible link: mediation through imaginative play. Time: the past recaptured.

RE-CONTEXTUALIZED ANALYSIS

(1) OBSERVATION: 4. James

Category: TIME

I want to talk to them ...
Time: present and past.
Irreversibility
Affective understanding.

Let's play Persephone ...
Tangible link: mediation through imaginative play
Time : past recaptured

TIME AND SPACE

He is looking at Knossos and the frescoes on the walls of the palace ...
Tangible link: images
Place: Knossos

Don't you wish you could go there? ...
Time and space
Different reference frame
Affective understanding
Invitation to discuss topic.

I wish I could go there ...
Time and space.
Affective understanding

It won't be the same ...
Time and space: time/temporal change and the past

because the people are all dead ...
Knowledge of death
Time and space
Time: past event Irreversibility of time
Affective understanding

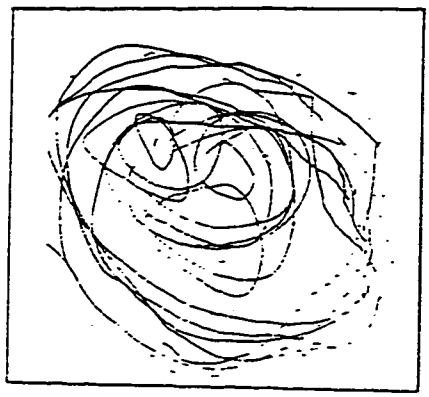
I wish I could go there ...
Time and space
Affective understanding of time and space
Irreversibility of time.

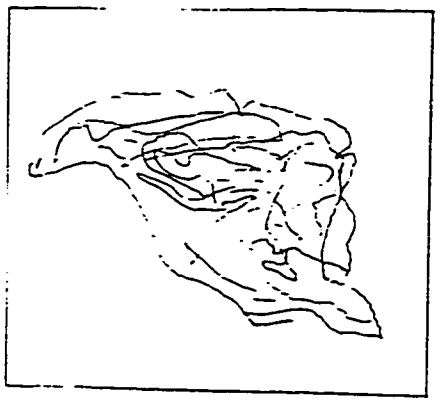
Appendix E

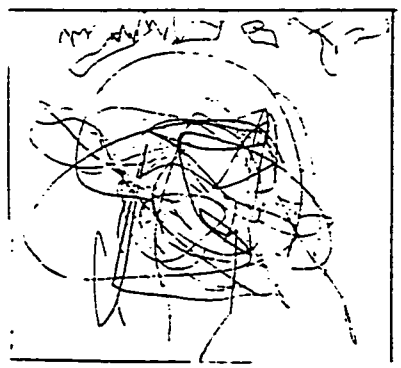
Analysis II

VISUAL DATA WITH COMMENTARIES:1

Jack: 4 years exactly







Jack is sitting very straight with four pieces of paper in front of him. Each paper has a map on it. He re-arranges the papers several times. They have an order. He looks at me several times. "Are you going to take my picture?" He is proud of his work. We take his picture. I sit down next to him. He asks me if I am ready. I smile, yes I am ready. "O.K This is a round world. I made this for people to see and to go on. It is a world". And so I ask if it is our world, the Earth? He says no, it is just a world. I ask about North, South, East and West, he says that "that doesn't exist there". On to the next map. "This is North America. It's a real place, really real,

cowboys live there, it's only a piece of the Earth...yes, North America has North South East and West and it is round because somebody told me and I listened!". He points correctly to all directions. I ask about the 3rd map. They look like a bunch of scribbles. "I made a continent, a pretend continent". Jack becomes very contained. "It is a story about a ghost land...and...if you go there, they will change you into another ghost. It is a story with magic!". He nods his head. "And then...I made another pretend continent!...Can we make a book?". We write out his comments under each map and make a book. He looks at it for a long time.

DE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA WITH COMMENTARIES: 1. Jack: 4 years exactly.

Are you going to take my picture? ...
Identifying importance

this is a round world ...
Space
Map literacy

for people to go on...
Space/location...

North, South, East, West don't exist there...
Map literacy
Imaginary place

This is North America...
Place/Location
Map literacy

It is a real place...
Place: distinction between the real and the imaginary

really real...
Linguistic label creating meaning

cowboys live there...
Place
Tangible link
Affective understanding

only a piece of the Earth...
Map literacy

Points to all directions...
Map literacy

I made a continent...
Map literacy

a pretend continent...
Place
Affective understanding. Knowledge of the "real" and the "imaginary"

Its a story about a ghost land...
Place: imaginary
Tangible link

Its a story with magic...
Place: imaginary

Looks at it for a long time...
Identifying importance

RE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA WITH COMMENTARIES: 1. Jack

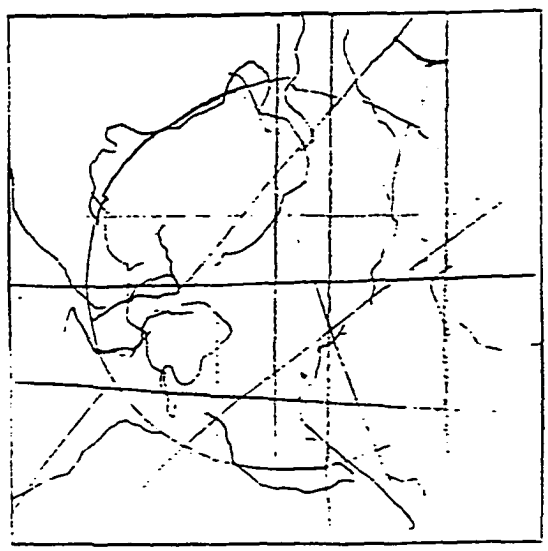
All the previous de-contextualized data is classified into the category of: SPACE except for:

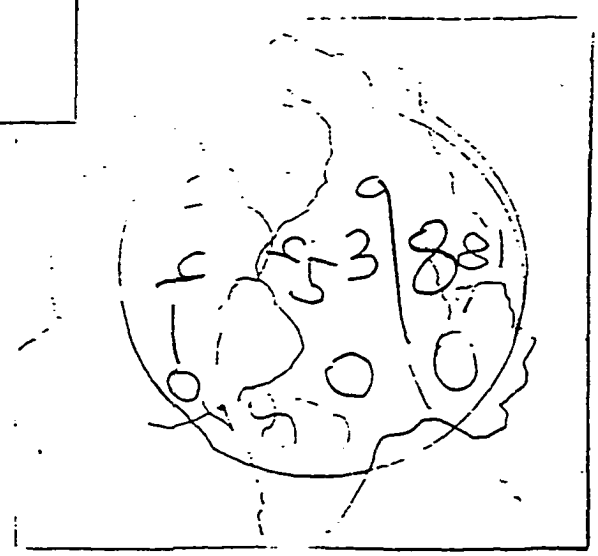
Are you going to take my picture? ...
Identifying importance

Looks at it for a long time.
Identifying importance

VISUAL DATA AND COMMENTARIES:2

Emilia: 4 years and 6 months.





Emilia is kneeling on her chair leaning over the table putting stickers, little blue bunnies, on her book. My assistant has already compiled Emilia's work into a book. Emilia still kneeling on her chair hides the book behind her back and beaming from ear to ear instructs me to: "Sit down!" She has a way with words! I sit down. She jumps off her chair and puts the book in my lap with great pride, leans heavily against me and says: "Read it!". We read. "The World, Maps by Emilia". It has two pages with two maps. On the first page: "The World, this is a map of the World, it is

for people to go around the world". This map has a circle in pencil, lines of continents and straight lines crisscrossing each other. The second map has only numbers on it with shapes of continents. I ask about the lines and numbers, Emilia points to the longitude and latitude lines on the World map next to us on the wall. I ask about who would need those lines. She tells me: "People, in boats, you know, like Marco Polo..." At this she wiggles and squirms, she has fallen in love with Marco Polo..."Is this a map for Marco Polo?" Now she giggles : "Yes!" We laugh together. "You like Marco Polo?"..."Yes!". I ask her if she can go and find Marco Polo anywhere in the world. She becomes silent. "In the movie I can...no, not really". I have made her very serious. I regret it. We go find the book on Marco Polo and read it together.

DE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA AND COMMENTARIES: 2. Emilia: 4 years and 6 months

Sit down!...jumps off chair...leans heavily...read it!...
Identifying importance

This is a map of the world...
Place
Map literacy

it is for people to go around the world!...
Identifying importance
Map literacy: has identified the uses of maps

people in boats...like Marco Polo...
Identifying uses of maps
Tangible links to time and space. Time: Marco Polo
place: the map

You like Marco Polo? - Yes!...
Affective, tangible link to both the past and world geography

In the movie I can...no, not really...
Irreversibility of time.

RE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA WITH COMMENTARIES: Emilia

Category: TIME

In the movies I can...no, not really...
Irreversibility of time

people in boats...like Marco Polo...
Identifying uses of maps
Tangible links to both space and time. Time: Marco Polo
Place: the map

Category: SPACE

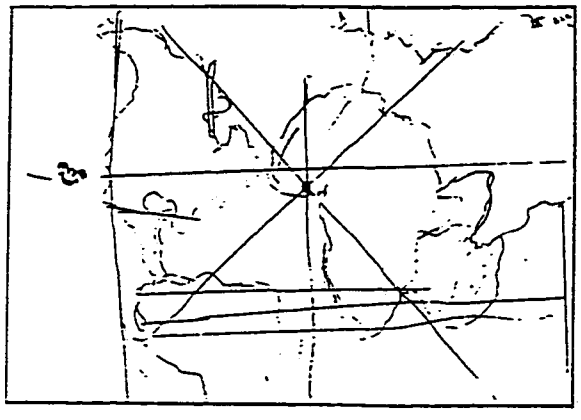
This is a map of the World...
Place
Map literacy

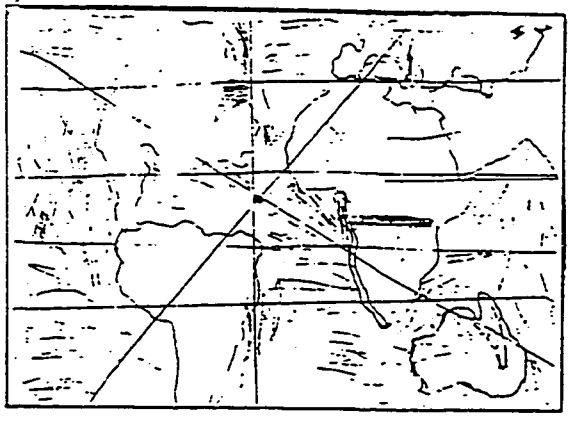
It is for people to go around...
Identifying importance
Map: literacy: has identified the uses of maps

You like Marco Polo? - Yes! ...
Affective, tangible link to both the past and world geography.

VISUAL DATA AND COMMENTARIES:3

Julie: 4 years and 10 months.





Julie is very shy. She has made two maps of the world, both are very similar, second one is much better. She shows them to me very proudly and explains her efforts at making a better map. She tells me she didn't like the first one so she made another one. We talk. She knows the names of all the continents, the cardinal points, the

oceans, she knows latitude and longitude. She has made the maps using small wooden forms. She knows where Michigan is. Each continent is a different color. On her desk she has arranged sets of pictures according to each continent and so we go through each set. I let her talk. She tells me about mountains, deserts, rain forests, animals and people. She tells me that her favorite time period is the Middle-Ages. She had played the part of a princess in our school pageant. We look at pictures of castles and knights in armor. I ask her if she went to these places would she find the castles, she nods her head, I then ask if she would find the kings and knights. Julie thinks for a while. "I might, but they wouldn't look like these..." she points to the knights in armor...Julie's little sister joins us and the conversation turns to other things.

DE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA AND COMMENTARIES: 3. Julie: 4 years and 10 months

...explains her efforts at making a map...
Identifying importance

Knows the names of all the continents...
Cardinal points...
Latitude and longitude...
Where Michigan is...
Mountains, deserts, rain forests...
Animals, people...
Map literacy

Favorite time period is the Middle-Ages...
Time

If she went to these places she would find the castles...
Space permanence

...but they (people) wouldn't be like these (knights in armor)...
Irreversibility of time

RE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA WITH COMMENTARIES: 3. Julie

Category: TIME

Favorite time period is the Middle-Ages...
Time

...but they (people) wouldn't be like these (knights in armor)...
Irreversibility of time

Category of: SPACE

Knows the names of:
All the continents...
Cardinal points...
Where Michigan is...
Mountains, deserts, rain forests...
Animals, people...

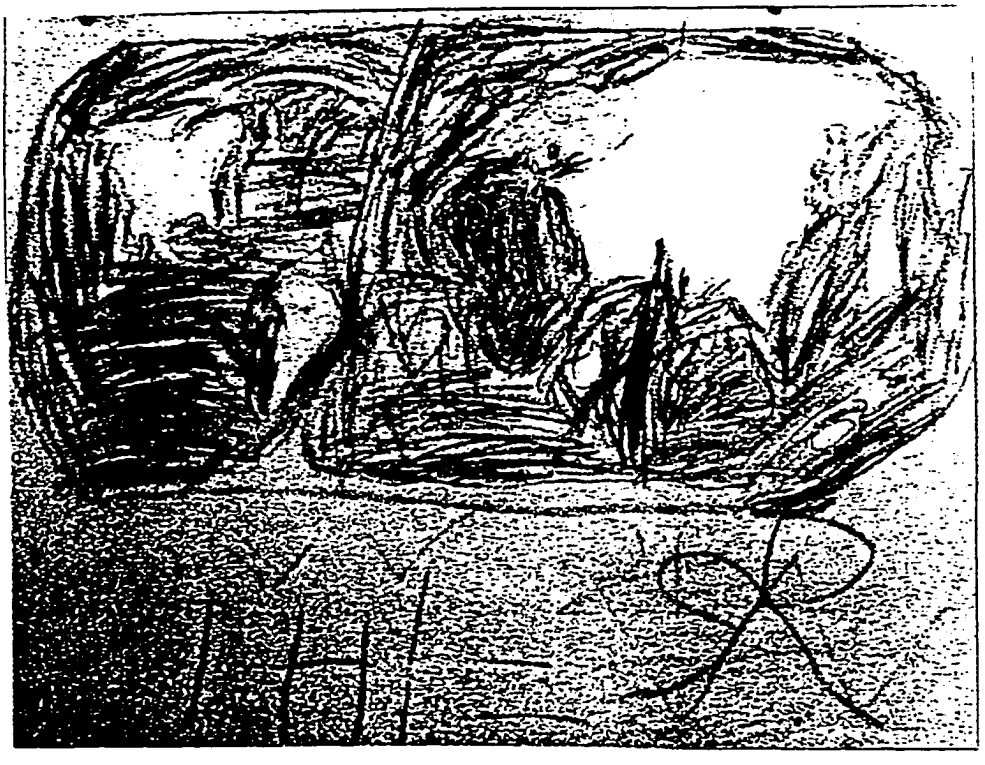
Map literacy

If she went to these places she would find the castles...
Space permanence

Identifying importance:
...explains her efforts at making a map...

VISUAL DATA WITH COMMENTARIES:4

Joseph: 4 years and 10 months



Joseph has finished his map. He has been working on it for 2 days. We sit and marvel about it. The map was done free hand. I ask him if it is a homolographic projection. "Yes, but it is really a picture of the world...I made it because I don't want to forget it...I am going to kindergarten next year, my brother said we wouldn't be talking about the world...I just made a picture of it because I like it a lot!". Later that day he sat with his teacher and told all about dinosaurs, woolly mammoths, whales

and all things that are important to him...where he lived, where his father came from, an island in the Caribbean, where his grandparents spent their summers...all the while as he talked he pointed to his map, locating, describing, telling of all things that he loved...

DE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA AND COMMENTARIES: 4. Joseph: 4 years and 10 months

...finished his map...he has been working on it for two days...
Identifying importance

...It is a homolographic projection...
Map literacy

It is a picture of the world...I don't want to forget it, I like it a lot...
Space
Affective understanding

...and told all about dinosaurs, woolly mammoths, whales...
Map as tangible link to space and time

...pointing, locating on his map all things important to him...
Map as tangible link

RE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA WITH COMMENTARIES: 4. Joseph

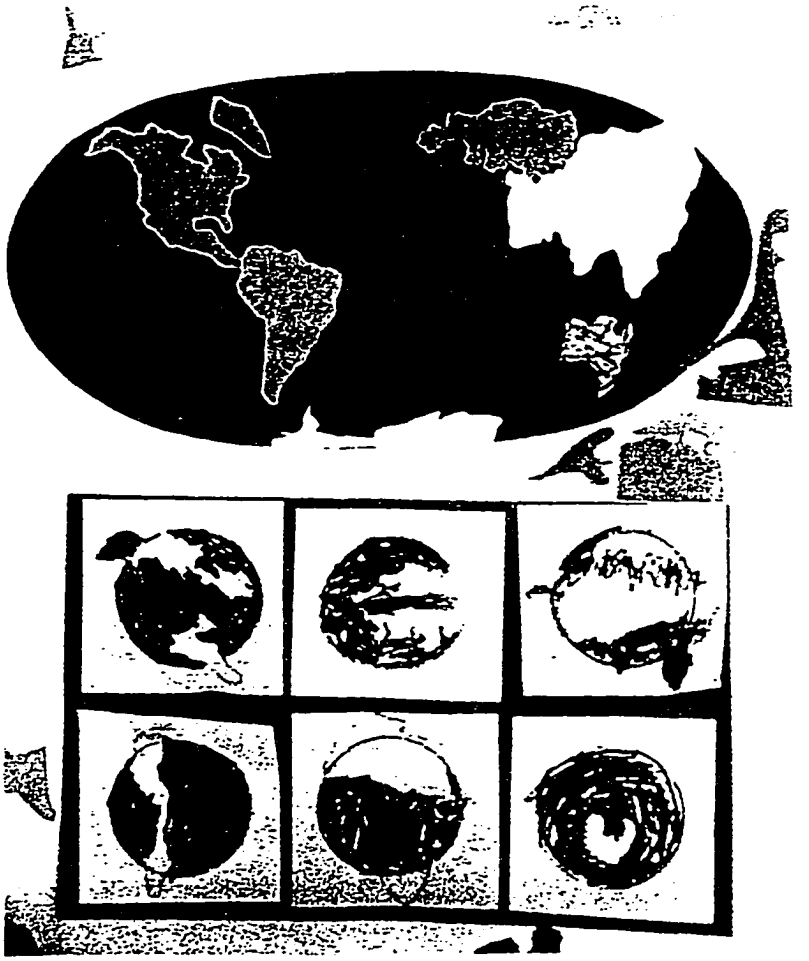
There is only one category in this data, that of: SPACE

Identifying importance

...finished his map...he has been working on it for two days...

VISUAL DATA WITH COMMENTARIES:5

Joseph: 4 years and 11 months.



Joseph has been working all week on his map. All week people have been coming up to him to admire his work!. Today Friday 11:15 he announced that he had finished. His work is impressive! He worked on it entirely alone, planning, cutting, pasting, singing...I did not insult him by asking the names of the continents...I did ask

him about the little animals surrounding the top of the map. "Those, are dinosaurs! It is a map about when dinosaurs were alive, before they became extinct!". We talk some more. I then ask about his second set of maps, they are very beautiful to look at, so precisely done, each continent against the backdrop of a blue circle symbolizing the Earth. "The green is where the dinosaurs lived. Those are the forests". He had copied physical maps from an atlas. I asked: "Joseph, if we go to these forests will we find dinosaurs?". He is quiet, a little sad, dinosaurs are his passion, he plans on becoming a paleontologist..."No,... I wish we could though, don't you?"...

DE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA AND COMMENTARIES: 5. Joseph: 4 years and 11 months

He has been working all week on his map...
Identifying importance

Those are dinosaurs...
Time and space literacy

It is a map about when dinosaurs were alive...
Space
Time: remote time

...before they became extinct...
Event in time : knowledge of term

The green is where dinosaurs lived...
Space/time/location

those are forests...
Space/literacy

No,...I wish we could though, don't you?...
Irreversibility of time
Affective understanding
different reference frame: you

He wishes to become a paleontologist...
Time: mediation, recapture the past

RE-CONTEXTUALIZED ANALYSIS

(2) VISUAL DATA WITH COMMENTARIES: 5. Joseph

Category: TIME

...before they became extinct...
Event in time: knowledge of term

...No, I wish we could though, don't you?...
Irreversibility of time
Affective understanding
Different reference frame: you

He wishes to become a paleontologist...
Time: mediation, recapture the past

Category: SPACE

...Those are forests...
space/literacy

TIME and SPACE

It is a map about when dinosaurs were alive...
Space
Time: remote time

...the green is where the dinosaurs lived...
Space/time/location

Identifying importance:
He has been working all week on his map...

Appendix F

The First Frontier

FIRST FRONTIER

This is an overview of the specially designed program which was called The First Frontier. It is not presented in the form of lesson plans for it is a recountal. It tells of what happened to the sample children of this study.

The introduction to the program is described more at length for it was the prelude to their understanding of all that followed.

In keeping with the children's patterns of thought and interests, the children's attention was turned to space and the appearance of the earth from space. At the same time their attention was brought to the skies; the moon, the sun, the stars which at one time seemed to be all they talked about. Many presentations and activities overlapped which helped the children make further associations.

During the first weeks of school the objectives were to bring the children's attention to the relationship that exists between the sun, the cardinal points and the axis of the earth. The axis of the earth was in fact not broached, only the seasons with the equinoxes and solstices.

These were the steps taken.

PRELUDE

I In the classroom:

Move from the whole to the parts. From the earth seen from space to making of maps.

II Sky watching:

Move from the North Star to the sun, to the cardinal points, to time and finally to the seasons.

III In the classroom:

Bring all that they had observed to the alternating patterns of time and to the naming of the cardinal points on maps.

IV Begin History and Geography.

PRELUDE

I In the Classroom:

"slides"

In order to familiarize the children with appearance of the earth from space, slides were shown of stars, constellations, planets and finally the earth. Large photographs followed. Comparisons were made between the slides and the photographs. The children lined up the photographs in terms of preference. Questions were answered. The older children who had seen the slides the previous year joined the group. They were very serious and gave an important message to the younger children; "This is the earth! We live on it! It is really, really big!".

"Globes"

Next, many different globes of every size and type were brought into the classroom. The globes were informally discussed, all questions answered. They had their preferences, particularly the one that lit up. After a while Emilia owned it!

Comparisons were made between the slides, the photographs and the globes.

"maps"

Very soon after the globes were presented, many maps of the world were brought into the classroom, again of every size and type. All the maps were homolographic projections from National Geographic. Comparisons were made between the three renditions of the earth. Maps were wrapped around the globes. The older children were very helpful; pointing things out; showing the younger ones different features of the world, where Michigan was, and that we lived "right There!". The younger ones were very serious. Vocabulary was given, world, earth, land, water, and then continents, oceans. New words were always given within a sentence, they took to new words quite well, even liked to repeat them at length. Now the children were ready to experiment with map-making.

"map making"

The children were given blue homolographic shaped papers, again of many different sizes. The proper terminology was given for these shapes. The children were invited to make their own maps. At first the continents were cut out of the National Geographic maps and pasted onto the blue shapes. Very soon they wished to make their own maps.

In order to help them do this, two materials were presented to them. One was in the form of a puzzle. A homolographic projection of the world made of wood, about two feet wide, small enough for the children to carry it to wherever they were working. The continents were removable each of a single and different color against a pale blue ocean. The Montessori orthographic map of the world was not used. Past experience had shown that this rendition of the world was confusing to them. Children would make little bridges between the two circles so that people could go from one side of the world to the other. Accompanying the wooden map were templates of each continent, individually mounted on blue wood. The insets of the continents were slightly raised and removable. This allowed the children to feel the edges, hold them in their hands and then trace them at will. These two materials offered two approaches to making maps.

Vocabulary was given: the names of the continents and the oceans. Maps were made in many different sizes and also of many different textures. Many different kinds of papers, cloth even. Anything that could be cut and pasted. Some were painted, some drawn. The children brought materials they liked from home. Very large maps were made and also very small ones that could fit in their pockets. These were laminated so that they could last a long time. The maps went up on the walls, in the classroom, in the hallway and then went home. Pictures were taken of the young cartographers with their maps. They learned new words: map projection; homolographic projection, a Robinson projection. The children had now experienced the world in different ways and at increasing levels of difficulty.

One outgrowth of these map awareness activities transferred into the art area. While at the easel with paints they often spontaneously brushed the shape of the world, Africa or North America, along with circles and stars, the sun and the moon. Sometimes these were all together. They explained their paintings to anybody who would listen, using their new vocabulary. Some made little pictures of themselves, or their dog, or their house where they lived, in North America. Jack made a picture of himself with horses. He liked cow-boys.

Large glossy Geography books kept them very busy! Books on constellations were fascinating to them!

Instruction had now moved to the naming of the cardinal points. They had been prepared for that through parallel presentations and levels of awareness.

II Sky Watching:

"Stella Polaris"

At the beginning of the school year, when parents and children arrived to school, the parents were asked to take their child outside after nightfall and to gaze at the night sky. They were to find "Stella Polaris" by first locating the constellation of the Big Dipper. They were to line up the two end stars, draw a line in the sky and find the North Star. The children were given many black disks of paper, twelve inches in diameter and little silver sticky stars. Whenever they found the North Star, they stuck their stars and brought the paper back to class and shared with the other children. Many times they spoke of the Moon and it's different appearances. At this time they started to use the linguistic label of: "very, very, VERY far away". When this was said, there was always a nodding of heads, or they repeated the words. The children were also given larger stars that glowed in the dark to stick above their beds.

This activity lasted until the nights grew too cold. Parents who lived in the country, and had clearer night skies, would invite other families to have a "Find Stella Polaris party!". Each child was now given a little compass. Now the North could also be found during the day! All of this was discussed in class. They were told that Stella Polaris helps us to find the direction of Cardinal North and so does a compass. Many beautiful books were looked at to show different kinds of compasses. On the many globes in the classroom they were to find the North Pole. Of course finding the North Pole was a major discovery! Santa Claus lives there!

"The sun"

As fall settled in and the nights grew longer the children arrived to school in time to watch the sun rise! The school was fortunate, with large low windows looking out to the East, South, and West. The playground, a meadow ran down to the edge of the woods. The horizon on all sides held only trees!

Two new words were offered to the children: horizon and direction. While out in the meadow much attention was brought to the "horizon". Also many activities had them go in different "directions". After a while they used these words with ease.

"The sun and cardinal points"

Every morning first thing, the children located the sun on the horizon. They were told that the sun rises in the East. The word direction was now used. The sun's positions were pointed out to the children at various times of the day. As the days went by they noticed that the sun was moving along the horizon: towards the South! And so they learned "South". At lunch we also found South and the sun's position in the sky. Soon they also knew "West". A lot of games happened outside using the words direction and all the cardinal points. The parents were instructed to do the same at home.

"The sun, cardinal points and Time"

In order to have the children associate the cardinal points with the hours of the day, a large sundial was brought out in the meadow. The children were told what it was. It was made of stone, low and quite beautiful with a scrolled metal style. On the sundial both the directions and the hours of the day were written. The sundial needed to be oriented, so with the help of the children, compasses, a lot of discussion and where the sun was in the sky, the sundial was oriented. Everybody looked at it. After a while they asked: "what do those things say?" "Those are Roman numerals, they tell us the hours of the day, but only when the sun falls on the style and gives a shadow". Now they could tell the time just by watching the shadow of the style. Correct terminology was always given to them, and they used it well! Also the Roman numerals were convenient for when we spoke of Rome. They were each given a little sundial to take home. Each day one or two children went outside to check on the time, compare it to the sun and then they brought back their observations. When the style hit "XII" and the sun was high in the southern sky, we always had lunch.

Large beautiful books were looked at to see all the different kinds of sundials that exist.

At about the same time, after talking about the stars the moon, the sun, and directions, a calendar was offered to the children. The word calendar was not given immediately. A very long band of paper, about eight inches wide was put at their eye level and it ran the length of the room. It was made of light blue paper and black

paper. Both undulated, giving an alternating pattern, that of day and night (See Figure below).

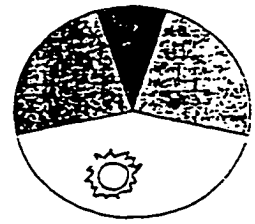
Alternating pattern of day and night.

Each day as the sun rose on the horizon, the children put a "sun" on the blue of the band. The suns were made of orange and gold paper, kept in a gold box with jewels on it from Lebanon. Emilia decided that she would put the moons up on the black paper whenever she had seen it on previous nights. The moons were silver kept in a black lacquered box from China. After a while we decided to count the suns by putting a number on each sun as they went up each day. The children were told that this was a calendar: some people count the suns, some people count the moons. Once the program had reached Islam it was easy to tell them about lunar calendars.

It was about at this time that the children noticed that the sun never went to the North. They decided that the North belonged to Santa Claus. Emilia didn't agree and said that it belonged to Stella Polaris. Joseph agreed with Emilia and since both of them were highly respected all was settled. At times they displayed animistic traits that really helped them to understand complicated concepts.

"The seasons, the sun on the horizon"

As fall progressed, over the frosted trees the children noticed that the sun had moved further along the horizon toward the South. In order to explain this movement of the sun a new material was made. It was a large disk, twelve inches in diameter, which was to represent the horizon. Two movable pieces of black poster-board allowed to show the children, by slowly moving the black pieces of paper toward the South that the nights were getting longer and the days shorter and also colder, the earth didn't get a lot of sun during the day (See Figure below).



Movable parts. Alternating pattern of the seasons

We did this together but did not let the children have access to this material since the entire concept had not yet been fully understood.

III In the Class-room

"The cardinal points enter the classroom"

It was now time to associate the cardinal points with the maps. In the center of the room there were two concentric circles. This was a place to gather the children for presentations, or work in general. It was carpeted in pale blue, a color they liked. The children were asked to indicate where the cardinal points were. They looked at me. This was now common knowledge. First they pointed East, then North, then South and then West. Then they were asked if we could write these directions on the inner circle. The children were unexpectedly excited. They helped to put the plastic blue letters on the yellow circle. At the center was a cross pointing North, a compass rose. Once finished they ran to all the directions, saying: "Now I'm North, now I"m South..." From that point on, talking about cardinal points and maps was no problem at all. The circle was already the work area for making maps, when they made a map they were asked to face North.

Presentation of the cardinal points:

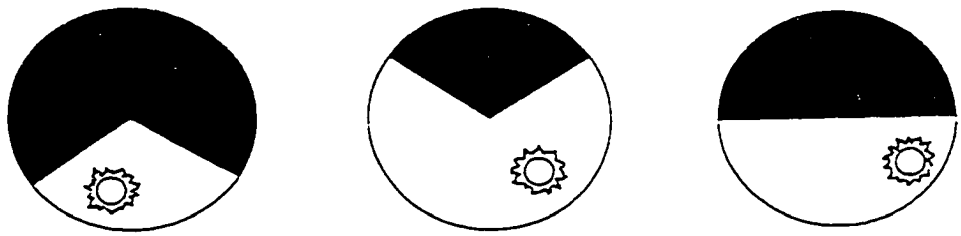
The children's favorite globe was put on the compass rose. They knew where North was on the globe, so we matched it with the North written on the circle. They knew where Antarctica was so that was matched with the South written on the circle. After which we looked for where East and then West would be on the globe. The globe was rotated slowly counter clock-wise. They arrived at the idea that the cardinal points never change wherever the Earth turns. After this we put a large map on the compass rose, matched the poles and found out where East and West where. One exercise was to have them put their finger in the middle of the map and then to move their finger North. This question was put to them: "In which direction are you

going?". We experimented with each cardinal point and direction. We had already done this exercise out in the meadow, using the teacher as the compass rose, so this was not difficult for them. Now they knew, or felt, or could know the relationship that existed between the cardinal points and the sun. They would repeat this exercise without the teacher. One interesting aspect of their understanding was that as questions were put to them on directions and cardinal points, they would glance outside, to the East or the sun.

Now the time had come to start History. For this another material was made that would allow children to constantly link both geography and history. A large flat quilt was made representing a homolographic projection. It measured four feet by eight feet. The whole center was the projection. It was made with the colors and the textures they liked. The oceans were of pale blue silk, and the continents were of velvet, bordered in midnight blue. This was where all the history lessons were presented, all the stories, all the presentations of artifacts. Time moved but the map stayed the same. All the maps stayed the same! This is where the children made their maps and also matched laminated pictures of different continents, then countries to the proper continents on the quilt. The pictures were color coded with each continent so they could correct any mistakes quite privately. In fact, correcting their own errors was all part of the fun.

"The Seasons, the winter Solstice, the equinoxes"

As the nights grew longer and colder, a special day came along: "The Winter Solstice". It was explained by using the material with movable parts and then the children were given their own material: a large disk of twelve inches that showed how long the nights were and how long the days were (See Figure below).



a: Winter solstice b: Summer solstice c: Equinoxes

This special time was celebrated by lighting candles in a circle out in the snow as the sun rose. The whole school participated. Of course the parents always put on a good show. One parent decided to wear a cloak and chant for the spring to arrive and plants to grow and flowers...! It was a lot of fun for all of us!

The equinoxes and the solstice were looked at and talked about by adding pictures of the seasons with each disk. Both the disks and the pictures were then matched by the children to the directions on the yellow circle.

Presentation for the seasons:

The movable disk was put on the compass rose. The children sat facing North. The teacher always sat with her back to the North. In front of the children the four disks of the equinoxes and solstices were lined up. Next to the disks photographs of seasons were matched. The teacher started with the winter solstice which they already knew and asked: "Where does the sun rise?" "Where does the sun set?" "Which is longer day or night?" "What season are we in now?" They matched the appropriate pictures and disks. This was repeated for all the seasons, until they noticed that the sun oscillated along the horizon. The material with the movable parts was very convenient. Now they knew the relationship between the sun and the axis of the Earth. That is, they knew, or felt, or could know. They repeated this exercise on their own, as often as they wished. Again as with the presentation on cardinal points, the children often glanced outside before answering.

Of course it was all a geocentric understanding, but really of no consequence considering all the learning that had taken place and how very young they were.

The story of the earth started with pictures of different periods in its formation. Moved to crinoids and then dinosaurs. Wooly mammoths came next with cave people. We moved to Egypt, ancient Greece and then Rome. The middle ages followed, until we arrived to the Americas.

Greek myths were told in Greece. When the spring equinox arrived Joseph announced that "It's about time for Persephone to come back up!". We spoke of Marco Polo, Yaqut, Galileo, navigators, painters, kings and queens, we looked at beautiful landscapes, deserts, mountains, waterfalls, animals, people, ancient cities, architecture, art and music. Always maps and history went hand in hand. History was told in story form, to accommodate for their dualistic ways of thinking, maps were always there to locate anything that we were talking about. All was used to bring to

them where in our story we were, in the world, what it looked like there, what did the people look like and what did they do? Once presentations were made, the music, the books, the artifacts and other things used, stayed in the classroom as work centers, one center following another gave a sort of time-line. Each continent held a special celebration. During the medieval period there was a medieval pageant: a dubbing of knights! The whole school participated.

The program unfolded day by day. Each day the children expected a new installment. At times history was brought to life, a medieval troubadour visited our royal court and played the lute! A professor from the local university! One day from the woods, a Potawatomi ventured through the meadow. He offered feathers and shiny stones. One child offered his map...that was Joseph.

And so it went...

Appendix G

Survey Instrument Questionnaires

SURVEY INSTRUMENT - QUESTIONNAIRE

CATEGORY 1A: SPACE-GEOGRAPHY ATTRIBUTES
Child Interviews - Seven Children

These questions are representative of the goals of the special social studies curriculum experienced by the children between the ages of four and five probing the possible lasting effects which this program may have had on them.

SPACE-GEOGRAPHY

What do you remember most about social studies in pre-school?

1. Do you like to look at maps?

2. What kind of maps do you like to look at?

3 When you go somewhere do your parents let you look at the map?

4. Can you figure out which direction you are going in?
Can you find towns? countries? different places on the map?

5. Do you know where North is on the map?

6. Could you draw a map of the world? Here is some paper, now can you make a quick map? Try to indicate "North, South, East and West" on it. Where is the equator? (Give the child a piece of paper and a pencil).

7. Ask the child where each continent is.

8. Do you know what the word environment means? When people talk about "saving the environment", do you know what they mean?
If no : Explain the meaning.
If yes: Why is it important?

9. Do you like to travel? What do you enjoy when you go on a trip?

10. Do you have friends who come from faraway places? From a different country?
If yes: Do you know where that country is on the map?

11. What is different about your friend?

12. Why do you think this difference exists?

PROBES:

Yes...Can you explain?...is there anything else that you would like to add?...can you think of anything else?

SURVEY INSTRUMENT - QUESTIONNAIRE

Category 2A: SPACE - GEOGRAPHY INSTRUMENTS
Child Interviews - Seven Children

SPACE-GEOGRAPHY

N.B: The child's name is to be inserted at the *** sign.

What does *** remember the most about social studies in pre-school?

1. Does *** like to look at maps?

2. What kind of maps does *** look at?

3. When you go somewhere does *** look at the map?

4. Can *** figure put which direction you are going in?
   Can *** find towns? countries? places on maps?

5. Does ***know where North is?

6. Would you please draw a map of the world?

7. Please indicate the names of the continents, cardinal points and the equator.

8. Does *** care about "saving the environment"?

9. Does *** like to travel?

10. What does *** enjoy while traveling?

11. Does *** have friends from foreign countries?
    Does *** link people with their places of origin?

12. Does *** understand that different ways which people have can be due to their place of origin?

PROBES:

Yes...Can you explain?...is there anything else that you would like to add?...Can you think of anything else?

SURVEY INSTRUMENT - QUESTIONNAIRE

Category 1B: TIME-HISTORY ATTRIBUTES
Parent Interviews - Seven Parents

TIME-HISTORY

1. When you hear a story about once upon a time, or about a long time ago, do you like that?
   If yes: Why do you like that?

2. Do you like stories about famous people who lived in the past?
   If yes: Do you know any famous people who lived in the past?

3. What about famous groups of people who lived in the past like "Vikings" or "Roman"? Which is your favorite group of people?
   If yes: Why do you like those people?

4. Do you like to look at old buildings? monuments? Do you like different kinds of architecture? Do you like to buildings?
   If yes: Why do you like old buildings?

5. Do you like to visit museums? What do you like to find in a museum?

6. Do you like artifacts (explain the word) from other countries?
   Do you have any?

7. Do you have any collections?

8. Do you like music from other countries?

9. What do you really like to learn in school?

10. Is there anything that you are really good at in school?

11. What would you like to be when you grow up?

PROBES:

Yes...Can you think of anything else?...Is there anything that you would like to add?

SURVEY INSTRUMENT - QUESTIONNAIRE

Category 2B: TIME - HISTORY ATTRIBUTES
Parent Interviews - Seven Parents

TIME-HISTORY

1. Does *** like to listen or read about history?

2. Does *** like stories of famous people who lived in the past?
   If yes: Does *** like any of them in particular?

3. What about famous groups of people who lived in the past, such as "Vikings" or "Romans"? Does *** have an interest in any other group of people?

4. Does *** like different kinds of architecture?

5. Does *** like to visit museums?
   What kinds of museums does *** like?

6. Does *** like artifacts from foreign countries?

7. Does *** have any collections?

8. Does *** like foreign music?

9. What does *** like to learn about in school?

10. What are your child's strengths in school?

11. What does *** want to be when (he or she) grows up?

Do you think that the social studies program which *** experienced in pre-school had any effect on *** ?

PROBES:

Yes...Can you explain?...Is there anything else you can think about?...is there anything else you would like to say?

BIBLIOGRAPHY

Allen, T.W. (1974). Patterns of attention to temporal stimulus sequences and their relationships to reading achievement. Cognitive Development, 46, 1035-1038.

Astington, J. Smith, G. (1988). Developing theories of mind. Cambridge, Cambridge University Press.

Ball, M.S.; Smith, G. (1992). Analyzing visual data. Newbury Park, Sage Publications.

Barone, T.E. (1992). A narrative of enhanced professionalism: Educational researchers and popular storybooks about people. Educational Researcher (November), 15.

Becker, J. (1991). Curriculum considerations in global studies. The 1991 ASCD Yearbook, 67-85.

Bettleheim, B. (1977). The uses of enchantment: The meaning and importance of fairy tales. New York, Vintage Books.

Blaut, J., & Stea, D. (1974). Mapping at the age of three. Journal of Geography 73 (Oct.): 5 -9.

Blaut, J.M. (1997). Children can. Annals of the Association of American Geographers 87: 152-158

Bower, B. (1993). A child's theory of mind: Mental life may change radically around age 4. Science News, 144: 40.

Braudel, F. (1986). The identity of France. New York, Harper and Row.

Breisach, E.(1994). Historiography: Ancient, medieval and modern. Chicago and London, The University of Chicago Press.

Bruner, J. (1963). The process of education. New York, Vintage Press.

Bruner, J. (1990). Acts of meaning. Cambridge, Harvard University Press.

Bruner, J. et al. (1966). Studies in cognitive growth. New York, John Wiley.

Cain, M.S. (1999). The community college: a systems approach. Lanham, MD: University Press of America.

Capra, F. (1988). The turning point (6th ed). New York, Simon and Schuster.

Capra, F. (1994).From the parts to the whole: systems thinking in ecology and education. Elmwood Quarterly, Vol. 10, n.2-3 (summer solstice/fall equinox). p. 34-51

Cassirer, E. (1953). The philosophy of symbolic form. New Haven: Yale University Press.

Castner, H. (1990). Seeking new horizons. A perceptual approach to geographic education. McGill. Queen's University Press.

Clark, H. H. (1973). Space, time, semantics and the child: Cognitive development and the acquisition of language. New York, Academic Press.

Clark, J.M. Paivio, A. (1997).Dual coding theory and education. Educational Psychology Review 3: 149-20

Clary, M. (1987). Cartes et modèles à l'école. Montpellier, Reclus.

Conford, F. McD. (1952). Principium sapientiae: The origins of Greek philosophical thought. Cambridge, Cambridge University Press.

Costa, A.L. (1985). Developing minds. Alexandria, ASCD.

Donaldson, M. (1978). Children's minds. London: Croom Helm.

Downs, R.M. Liben, L.S. (1997).Geography and the development of spatial understanding. In R. Boehm, Petersen (Ed.). The first assessment (pp. 21-45) Skokie, Ill., Rand McNally, Inc.

Egan, K. (1997). The educated mind: How cognitive tools shape our understanding. Chicago, The University of Chicago Press.

Ellis, K.E. (1977). Teaching and learning elementary social studies. Boston, Allyn and Bacon, Inc.

Flavell, J. (1975). An interview study of children's knowledge about memory. Monographs for the Society for Research in Child Development, 40, 1-50.

Flavell, J. (1977). Cognitive development. Englewood Cliffs, Prentice-Hall.

Flavell, J. (1993). Development of knowledge about the appearance-reality distinction. Monographs for the Society for Research in Child Development, 51, 1-77.

Fraisse, P. (1944). The psychology of time. London, Eyre and Spottiswood.

Fraser, J.T. (1975). Of time, passion, and knowledge. New York, George Braziller, Inc.

Frye, D.; Moore, C. (1991). Children's theories of mind. Hillsdale, Lawrence Erlbaum Associates.

Fuller, B. (1972). Buckminster Fuller to Children of Earth. New York, Doubleday.

Goldman, A. (1973). Philosophical applications of cognitive science. Boulder, Westview Press.

Goldman, L. (1971). Immanuel Kant. London, NLB.

Harner, L. (1976). Young children's understanding of past and future reference. Journal of Psycholinguistic Research, 5, 65-85.

Harris, P.; Kavanaugh, R. (1993). Young children's understanding of pretense. Monographs for the Society for Research in Child Development, 58, 60-90

Harris, P; Kavanaugh, R; Dowson, L. (1997). The depictment of imaginary transformations: Early transformation of a symbolic function. Cognitive development V 12. 1 pp.127

Hegel, G.W.F. (1956). Philosophy of history. New York, Dover.

Jaeger, R. (1988). Complementary methods for research in education. Washington, DC, American Educational Research Association.

Krupp, W. (1997). Skywatchers, shamans, and kings: Astronomy and the archaeology of power. New York, John Wiley & sons, Inc.

Laszlo, E. Artignani, R. Combs, A. Csanyi, V. (1996). Changing visions. Human cognitive maps: past, present and future. London, England. Adamantine Press Ltd.

Lewis, R. (1998). Developing critical thinking through an interdisciplinary approach with social studies simulations and technology in fourth grade classrooms. Graduate research thesis series, D-1372 Thesis (Ed.D.) Tennessee State University.

Lincoln, Y.S., & Guba, E.G. (1985). Naturalistic inquiry. Newbury Park: Sage

McAulay, J.D. (1961). What understanding do second grade children have of time relationships? Journal of Educational Research, 54, 312-314.

Mead, M. (1975). New lives for old. Cultural transformation - Manus 1928-1953. New York, William Morrow and Company.

Moncrieff, R. (1966). Odour preferences. London, Leonard Hill.

Montessori, M. (1980). The absorbent mind. INC. Dell Publishing Co.

National Commission on Social Studies in the Schools (1989). Charting a course: Social Studies for the 21st century. Washington D.C., National Commission on Social Studies in Schools.

National Geographic Society. (1990). Peoples and Places of the Past. The National Geographic Atlas of the Ancient World.

Nevins, A. (1967). The art of history. Washington, Library of Congress.

Newman, F.; Holzman, L. (1993). Lev Vygotsky. New York, Routledge.

Norton, W. (1989). Human geography and geographical imagination. Journal of Geography, 9, 186-192.

Ornstein, R.E. (1972). The psychology of consciousness. New York, Penguin Books.

Perner, J. (1991). Understanding the representational mind. Cambridge, MIT Press.

Piaget, J. (1969). The child's conception of time. New York, Ballantine Books.

Piaget, J. (1972). The child's conception of time. Totowa, Littlefield, Adams & Co.

Poster, J.B. (1973). The birth of the past: Children's perception of time. The History Teacher, 6, 587-598.

Recherches Pédagogiques (1978). Activités d'éveil-Sciences sociales à l'école élémentaire (Social studies - Social sciences activities in elementary school). Paris, Institut National de Recherches Pédagogiques.

Savage, T.; Armstrong, D. (1987). Effective teaching in elementary social studies. New York, Macmillan Publishing Co.

Schubert, W. (1993). Curriculum reform. Association for Supervision and Curriculum Development, 1, 80-115.

Schwartz, N.H. (1997). Human information processing of maps: A report to the geographic community. In R. Boehm, J. Petersen (Ed.). The first assessment. Skokie Ill., Rand McNally.

Senge, P. (1990). The fifth discipline. New York. Doubleday.

Stoltman, J. (1991) In. J.P. Shaver (Ed.). Handbook of research on social studies (pp. 437-444). New York, MacMillan.

Stringer, E. (1996). Action research, a handbook for practitioners. India, PVT, Ltd. SAGE Publications.

Tesch, R. (1990). Qualitative research. New York, The Palmer Press.

Torney-Purta, J. (1982). Global Awareness Survey: implications for teacher education. Theory into Practice, 21, 200-205.

Vygotsky, L.S. (1978). Mind in society: The development of higher psychological processes. Cambridge, MA: Harvard University Press.

Yi-Fu Tuan (1987). Space and place. Minneapolis, University of Minnesota Press.

IMAGE EVALUATION
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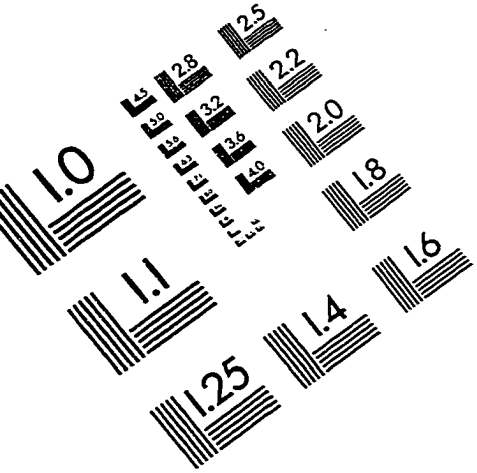

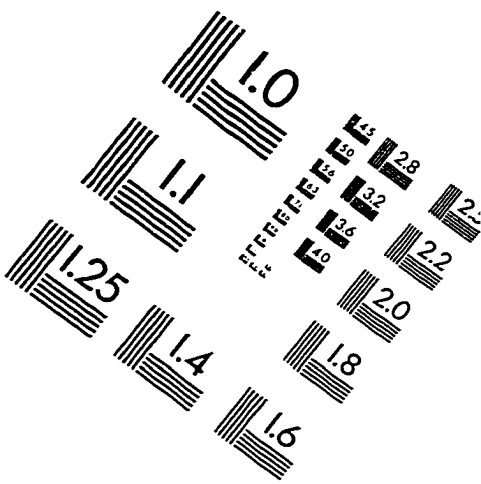

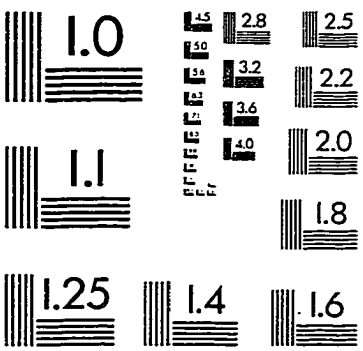

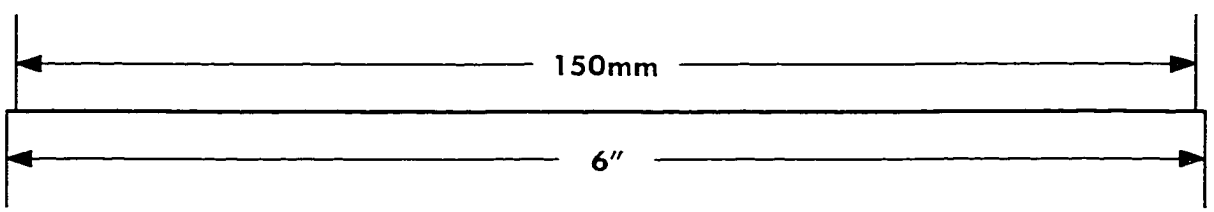

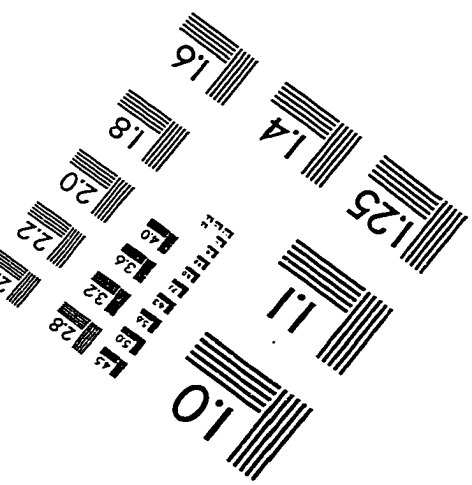

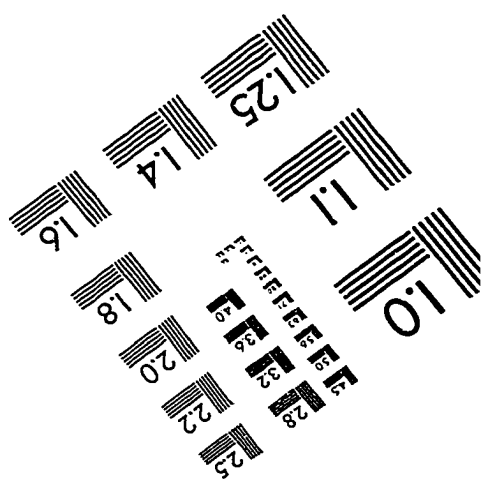

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