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TEACHING GEOGRAPHY IN GRADES ONE THROUGH THREE: EFFECTS OF INSTRUCTION IN THE CORE CONCEPT OF GEOGRAPHIC THEORY. FINAL REPORT.

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This project investigated whether children in grades 1-3 can learn the central conceptual system of geographic theory and can apply it appropriately in analysing the data of unfamiliar geographic regions. Two experimental curriculums were designed and introduced into 12 intact primary classrooms, matched for grade level and randomly assigned to one of the curriculums. Curriculum "A" gave instruction in the central organizing concept of the discipline, developed through practice in the analytic processes directing geographic inquiry. Curriculum "B" gave instruction in the major geographic generalizations, inductively developed from illustrative instances presented to children. Criterion instruments were designed to measure children's achievement in geography at three cognitive levels. The difference between the programs in knowledge acquired was statistically significant in grade 2 only. In both grades 2 and 3, children's mean achievement in comprehension of the concept and in ability to apply the concept in unfamiliar regional analyses was significantly higher under Curriculum "A." No statistically significant between-programs difference was obtained in grade 1. (Author/DL)

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March 1968

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education
Bureau of Research

TEACHING GEOGRAPHY IN GRADES ONE THROUGH THREE: EFFECTS OF INSTRUCTION IN THE CORE CONCEPT OF GEOGRAPHIC THEORY

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March 1968

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PREFACE

The elementary school is today the center of searching inquiry concerning its purposes, its organization, and its methods. Causes are rooted in a number of sources. Change, at a pace unparalleled in the history of society, has spawned a host of problems--urban, national, and international--and claimed the interests and expertise of specialists representing a range of disciplines. Major advances in the disciplinary sources of the curriculum--both in their research methodologies and in their development into new and challenging fields of inquiry--have together created a genuine hiatus between these advancing fields of knowledge and their representation in the schools.

The "new" mathematics, the "new" science, the "new" language are each efforts toward redress of this imbalance. Last to enter the field, the social studies are presently under thorough-going reexamination. Not since 1916, have we witnessed comprehensive revision in social studies comparable to the efforts now underway. Engaged in this endeavor are (1) Social Studies Curriculum Centers and research projects, established at a number of universities throughout the United States, with supporting funds from the U.S. Office of Education Cooperative Research Program; (2) state departments of education, engaged in curriculum development projects, supported in part with NDEA funds available for materials and consultants; and, (3) various curriculum projects supported by associations of scholars, concerned with the introduction or improvement of courses of study in their disciplines at the elementary and secondary levels. Programs include both single and multi-disciplinary efforts; both developmental and research-oriented projects; both single-grade and long-range programs, encompassing in some few cases the whole of the elementary and secondary years, kindergarten through grade twelve.

Most efforts share in the now widespread recognition that content in social studies is largely out of step with recent advances in scholarship; and that programs, by and large, suffer a general and sometimes serious disregard for scientific methodology of the disciplines. Meeting these problems, it is generally agreed, will require the coordinated efforts of teams of specialists--of scholars representing the disciplines, of researchers of curriculum and childhood learning, and of experienced classroom teachers and supervisors. Less widely recognized, perhaps, but not less important to effecting long-term change in the schools, is the need for rigorous, systematic testing of proposed methods for introducing, sequencing, and extending newly proposed learnings over the elementary and secondary school years. Projects are, presently, in the early stages of these efforts. Change, it is recognized, will be a more difficult, more comprehensive undertaking than was true in science and mathematics. To the degree current efforts meet the full challenges of this renaissance of interest in curriculum development, this period of reconstruction holds promise for genuine advance in the theory and methods of social studies curriculum practice in the schools.

The project reported in this volume was designed as an experimental research, concerned with studying children's learning of a central concept system in geography, under two different, but widely recommended, approaches to "structure" in the "new social studies." The project required, in Phase I, the development of two new experimental curricula in geographic education in grades one, two, and three. In experimental Phase II, this project submitted these curricula to controlled, classroom experimentation, in order to obtain evidence whether young children could learn the thinking operations and the central concept system of geographic inquiry; and whether either of the two experimental approaches held statistically significant advantages in the learnings acquired.

The project was initiated in Feburary 1964, under support from the Cooperative Research Program of the United States Office of Education, through funds available under Public Law 531.

Staff, engaged for the development of this curriculum, included a professional geographer, and a team of cartographers, curriculum specialists, and experienced classroom administrators, supervisors, and teachers.

A great measure of appreciation is due to these members of the project-staff, who participated throughout the long-term and exceptionally demanding requirements of a project of this scope and intensity. Professor Richard Logan of the Department of Geography, UCLA, met consistently with the project staff throughout its developmental and experimental phases, prepared background papers, suggested and designed appropriate geographic tools and methods for the instructional program, reviewed the validity of all instructional materials, assisted in analyzing our testing programs, conducted a course for the education of teachers in geographic methods and knowledge required for this study, and--in sum--provided an invaluable contribution to the project. Miss Carolyn Crawford, an experienced cartographer

..d graduate student in the Department of Geography, UCLA, brought her competence in cartographic methods together with her considerable artistic talents and gifted imagination to the development of the instructional resources of this project. Her high standards of cartographic excellence combined with imaginative insight into the instructional requirements of young children were a major contribution to the development of these curricula.

Miss Margot Coons, graduate research assistant in the Department of Education, contributed extensively to the field research and data-gathering operations out of which specific learning experiences were designed, and facilitated the in-classroom tryouts of materials through close cooperative work with the teachers. Sheila Ralsky, Charles Quigley, Lennon Paige, and Howard Stitt each contributed significantly in the development of the background materials and instructional resources, and in the testing of children. Contributions to the research design and statistical analyses were made by David Wiley, University of Chicago.

Particular gratitude is due the administrative, research, supervising, and teaching staff of the Santa Monica Unified School District of Los Angeles County, where the project was under continuing field test and experimentation. Their exceptional cooperation and enthusiastic participation in this project established an optimum climate for cooperative currilum development and experimentation. Particularly are we indebted to Dr. Fred Zannon, Associate Superintendent during the time this project was under development, Miss Lois Braun, Curriculum Supervisor who facilitated all arrangements throughout the research period, Dr. Julius Stier, Director of Research Services, and the school principals who facilitated our meetings with teachers and our continuing work within their schools, and who even marshalled in parent aid to assist in mass-production of some instructional resources. To the cooperating teachers who worked closely with us over the two and a half year period of this research, our most sincere appreciations are due. It was they, and the children of their classrooms, who in the end, provided the data for the substance of this report.

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CHAPTER I

INTRODUCTION

I. Statement of the Problem

A central issue in current reappraisals of the elementary school social studies curriculum is the question of how the substantive content of the social sciences is best introduced to children. Currently, rather widespread support has been given to the proposal that key concepts defining the structure of the disciplines are best introduced early in children's learning experiences. These concepts, established in the early grades, are assumed to facilitate continuous learning within the disciplines over the elementary school years.

Proposals for organizing social studies curricula around the primary structural elements of the social sciences--variously defined as organizing concepts, generalizations, key ideas, or modes of inquiry--are however, severly handicapped by the present dearth of knowledge concerning children's ability to learn the knowledge systems and intellectual workways being proposed. Proponents of curriculum change appeal not to empirical data but to values assumed to accrue from the curricula they propose.

Learning the central organizing concepts of a discipline, it is claimed, establishes a foundation for economical and continuous learning within the disciplines thoughout the elementary school years. Understanding the organizing elements of a field--as opposed to possessing the facts--supports the student in grasping, intuitively, critical relationships in a field of knowledge, and supports him in productive new encounters with unfamiliar data. Selecting the major idea-systems of a discipline reduces the learning load to manageable scope. Knowledge is expanding so rapidly, instructional time must be focused on what is of greatest worth. By implication, and by claim, the central concept-systems and inquiry methods of the disciplines are widely held to meet this criterion. They establish the nature of the field--its claim to knowledge--today; they direct the inquiries which reshape the discipline tomorrow.

Whether or not these claims will be substantiated in fact; indeed, to what degree young children can develop stable conceptual systems approximating the explanatory principles of the social scientist, are questions urgently in need of research. Fraser (6), for example, has recently cautioned that concepts, heuristically important to the scholar, will be several hierarchies removed from those levels of concept attainment children will find understandable. Structure too abstractly ordered or obtuse in its referents may serve to inhibit and not to facilitate young children's desired learning achievement. Some lesser, but valid, systems of structure, she suggests, will prove necessary in these initial stages of the instructional process.

Unfortunately, the idea of "structure" is itself a concept without clear definitional referents. As a consequence, newer discipline-centered curricula in social studies have taken a variety of approaches to the question of what constitutes "structure" in in a field. These differences seem less the result of individual efforts to tailor the complexity of a field to the learner's capacity for confrontation with it than they do the result of genuine disagreement on matters of definition. Projects, variously, have formulated the definition of structure to mean any one or a combination of the following elements of a field: its central organizing concepts; its "big ideas," the generalizations denoting its fund of tested knowledge; its "modes of inquiry" "analytic tools," or the "workways" of the discipline. These elements are, in some projects, treated singly, as in the case of those projects presenting a selected list of concepts or of generalizations to be learned. In other projects, these elements are combined into a system of related ideas. In one approach to an "organic curriculum," for example, the curriculum at each grade level incorporates an interworking set of economic concepts explaining the "market system." In some instances, these elements are combined in a related system of concepts directing disciplined inquiry within a field, together with the analytic tools or workways of the discipline permitting such inquiries to develop. This last approach is the least frequently employed. It probably comes the closest to Bruner's intended meaning of "structure," in the sense it gives practice to the analytic skills required if the learner is, on a small scale, to "think like" physicists, geographers, or mathematicians (3). Interestingly, this last approach is not the one Bruner illustrates, since the examples of structure he presents are largely "generalizations" from the several disciplines.

Presently, a serious need exists for intensive study of the effects of curricula designed to instruct children in the organizing structure of a discipline. Such research efforts, to be useful, will necessarily require careful definition of what is meant by structure and of the level of complexity of the cognitive operations involved in the criterion behaviors tested. This present research was designed with these purposes in view.

Purpose. The central purpose of this research was to determine whether young children, under appropriate instructional programs, could learn the central, organizing concepts of geographic theory; and whether, having learned those concepts, they could appropriately apply them in the analysis of unfamiliar geographic regions.

For this research one discipline only, geography, was selected. Its choice rested in part on the central importance of geographic education in elementary school social studies, and the fact a considerable hiatus exists between what passes for geographic knowledge in elementary school curricula and the nature of the discipline itself. To say most pre-collegiate instruction in geography is predominantly descriptive in character is probably as fair and favorable an estimate as can be made of the matter. Geography, it is true, was in earlier centuries largely a descriptive study.

Geographers, however, have meanwhile strongly advanced the scientific nature of their field. Such change has been particularly rapid over the past 15 years. Theory construction and the development of new tools for analysis and explanation have, as a consequence, far outdistanced the average teacher's understanding of the field. Children, as a result, continue to be asked to think largely in descriptive categories, to enumerate or describe features of a community, a continent, a political state. Where causal analyses are attempted, often in the man-land tradition of geographic theory, one finds long disbarred premises of "environmentalism," a special bias of the early century, still operative in classroom teachings.

In these ventures children are not engaged in geographic analysis. More serious, they are engaged, sometimes in the first instance, and certainly in the second, in genuine miseducation concerning geographic knowledge as it is developing today. In selecting geography as the data source for the objectives of our experimental curricula, this research proposed to study the effects of some new instructional objectives and methods in geographic education, validated as sound geographic experiences by geographers from the perspective of their discipline.

A second, and more important, reason for the focus on geographic learnings in this research lay in the unique opportunities this discipline offers for supporting young children's concept learnings through a variety of instructional materials ranging from highly concrete to highly symbolic representations of the conceptual systems under study. One of the most critical issues in the controversy over introducing higher conceptual systems to young children is the question whether they can engage in the cognitive operations these systems require.

Conceptual systems, Goss has noted (8), may be viewed as representing a range in complexity from simple classificatory schemes to complex covariant or causal relationships. The central, organizing concept-systems of the disciplines generally incorporate the latter. These higher-order conceptual systems are represented, in geography, by concepts of covariance and causality. Both are incorporated in the geographer's explanations of patterns of areal association and spatial interaction within and between regions, viewed both in the present and over periods of sequent occupance.

These relational and causal concepts are at the heart of geographic theory. As data sources for instructional objectives, they present a sober challenge to instructional planning at the primary school level. To claim that young children can think in the relational terms required by the central concepts of the discipline is to claim young children can comprehend causal and covariant relationships between data. Whether or not this level of relational thinking can be engaged in by children in grades one, two, and three is the central psychological issue underlying contentions regarding newer, discipline-centered curricula. This research was designed specifically to investigate this issue, under instructional programs designed to give maximum support to young children's relational thinking.

Related Research

There is, within the research literature, no evidence to be offered in support or reproof of the claim young children can learn the central concepts constituting the "structure" of a discipline. There is, however, no little evidence concerning the nature of concept-learning in the early childhood years.

Bruner (3), in recommending the early introduction of concepts central to the disciplines, has recognized certain imperatives placed on the instructional program by the nature of the young child's ways of viewing his world. These early school years, he notes, roughly parallel the stage of "concrete operations," a conceptualization derived from the researches of Piaget and associates. In these years the child internalizes symbolic systems representative of those operations accessible to him in immediately present reality. His grasp of certain basic ideas--in social science or mathematics, for example--is achieved not through the formal operations of logical thought, but in terms of concrete operations. The instructional problem, Bruner contends, is one of helping children pass progressively "from concrete thinking to the utilization of more conceptually adequate modes of thought." The process, he suggests, can be hastened, but not by instituting an instructional mode alien to the child's thinking.

A number of basic researches, extending Piaget's earlier studies, have affirmed a developmental order in children's acquisition of abstract, symbolically mediated concepts. Concept formation has been observed to proceed from children's early perceptually bound, pre-categorial responses through later stages of reduced perceptual support and increased symbolic mediation (27).

Applying techniques of scalogram analysis to children's development of the number concept, Wohwill obtained evidence for three successive stages in children's development of conceptual thinking. Noting this sequence to proceed, by degrees of symbolic mediation, from children's early dependence on perceptual support to their later elaboration of superordinate conceptual structures, Wohlwill confirmed, in behavioristic terms, Piaget's earlier theoretical position. In their acquisition of social concepts, children have been observed to respond in pre-categorial and categorial terms before recognizing, at later age levels, relationships between categories.

Danziger's (5) study of children's social concepts gives evidence young children, ages 5-8, respond verbally to questions of economic and kinship relations in pre-categorial and categorial terms and only at later age levels develop systems of reciprocal interaction between agents or variables in the concepts tested. Variability was noted, however, in age when these levels were reached, and was attributed to cultural differences, an oblique reference to the educative effects the particular society had informally effected. Such factors as individual variability in verbal fluency and IQ, or the schooling undergone were not examined, and, since instructional variables were entirely beyond the scope of the Danziger study, the pertinent questions school people must raise remain unexplored. Unfortunately, few studies have raised the question whether classroom instructional programs may effect the earlier emergence of those same concepts, nor have they studied in a definitive way the influences of specific curricular experiences on children's higher-order concept learning.

That elementary school children can understand relational concepts is supported by those researches of Piaget which have found the logic of classes and of relations developed in the concrete operations of the childhood years. The age citations given for the onset of these operations have been subject, however, to frequent dispute, as Piaget himself early anticipated (23). Inter-individual variability, or factors in the experimental task have variously been accorded a contributing role in the earlier incidence of these operations (2; 21).

The hypothesis that children's acquisition of higher order conceptual systems may be earlier induced under instructional programs appropriately designed to facilitate these learnings is importantly supported by a research of Keislar and McNeil (15). In a three-week experimental program designed to teach first grade children a theoretical language for explaining physical phenomena, they obtained evidence that young children can learn to give scientific explanations rather than the animistic, pre-causal accounts commonly expressed in these early childhood years. Similar evidence is lacking for children's ability to learn causal explanations for events in the social world.

Heidbreder's (10, 11) sequence of studies in the attainment of concepts provides, with marked consistency, evidence for the facilitating effects of perceptual support in concept formation. When such situational support was maximal, and critical features perceptually accessible, conceptual tasks were found to be performed more promptly, and presumably, with less effort. Especially important to this proposed research are Heidbreder's observations concerning the role perceptual support was observed to play when the concept, by nature of its abstractness, could not be made perceptually accessible. Then, the effects of appropriate situational support were those of facilitating the reactions by which the subject approached the point at which the necessary abstraction could be drawn.

Objectives

The major objective of this research was to submit to experimentation the question whether young children, in grades one, two, and three, can, under certain defined learning conditions acquire (1) understanding of the central concept-system of geography and (2) ability in applying that concept-system appropriately in analysing unfamiliar geographic regions.

It was the central thesis of this research that young children--ages 6 to 8--could, under appropriate instructional programs, learn concepts of covariance and causality in the social sciences, and could apply these concepts appropriately in criterion tasks requiring the interpretation of unfamiliar events. Because these are the years earlier described as the "stage of concrete operations," it was hypothesized, further, that such learnings would be significantly advantaged under an instructional program which: (1) structured for children perceptually available referents for the critical variables involved; and (2) established, in these early learning experiences, a mediating language to explain the events observed.

To test these assumptions, this study was designed to develop and evaluate two experimental programs in the social studies, planned for the primary grades of the elementary school.

In acknowledgement of the controversy concerning what constitutes the "structure" of the social sciences, two approaches to a definition of "structure" were incorporated in the experimental curricula of this research.

In Program A structure was defined as the core of organizing concepts which direct geographic inquiry, together with the analytic tools of the discipline.

In Program B structure was defined as a core of geographic generalizations, widely accepted by scholars in the field as representative of the body of tested knowledge produced by geographic research.

Methodologically, Program A incorporated research tools and inquiry methods of the discipline. Program B used an inductive approach, engaging children in formulating, under teacher guidance, geographic generalizations from the data presented to them.

While both programs, together with their instructional materials, are described again later in this report, the major features differentiating them are discussed below.

Program A, the Concept-Centered Curriculum

(1) This instructional program, experimental in content and design, was formulated to focus specifically on the objective of teaching young children the core concept of geographic theory.

(2) The concept was drawn from the discipline of geography, and represented one significant area of inquiry within that discipline: the regional approach to the study of the urban complex. Because this study was developed with children of Los Angeles County, it was the urban complex of greater Los Angeles, in relation to the region of Southern California, which was under study. The recent Symposium of the Association of American Geographers, concerned with a regional approach to the theme of man's impact on the land in Southern California, made authoritative resources immediately available to this project (25).

(3) The concept of areal association, identified by James (13) as the core around which geographic theory is built, was selected as the major orienting concept under study. It was developed

through children's analysis of a number of examples of causal or covariant interaction between features accounting for the character of the region. These examples included: (a) element-complexes, composed, at lesser or higher levels of integration, of elements closely related or dependent one on the other; and (b) process-relationships, representing functional spatial interactions between phenomena within the region as a whole.

With respect to Southern California and the Los Angeles urban-industrial complex dominating the region, the following systems of interaction were available as exemplars of the concept under study:

--Phenomena interrelated in place: The Los Angeles "urban-industrial complex," explained in terms of systems of interaction between such elements as available markets, resources, power sources, and population.

--Phenomena functionally interrelated between places, including: effects of urbanization on the agricultural landscape; and effects of transportation arteries on urban-industrial spread.

--Phenomena operative over successive periods of human occupancy: Comparative effects of human occupance--Indian, Spanish, and Anglo-American--on the natural landscape; processes and forces accounting for change; cumulative effects of modification; and resultant space relations.

(4) Curriculum A was designed to teach children the geographic concept of areal association by engaging children in geographic tasks of examining areal associations of features in selected geographic regions, and in analysing how those features "distributed" in the landscape. Patterns of areal association analysed were of three kinds: (a) patterns of correspondence in the distributions of two or more features within a region; (b) patterns of functional interrelationship between features within and between regions; and, (c) evidences of causal relaships, in the changing distributions of features, over time.

(5) These analyses were introduced in the three experimental Curricula A as follows:

Grade 1: Functional studies of the neighborhood and its relationships with the larger urban-industrial complex. Emphasis on patterns of association between geographic phenomena interrelated in space.

Grade 2: Comparative studies of the extended urban-industrial complex, with emphasis on patterns of association between geographic phenomena functionally interrelated between places.

Grade 3: Historical studies of sequent occupance in the region, with emphasis on factors accounting for change in distributions of geographic features, over time.

(6) The instructional program at all grades made use of newly developed materials, designed to clarify systems of relationship between geographic features in the regions studied. Because these are the years (grades one through three) frequently characterized as the "stage of concrete operations" (22, 3), instructional materials were designed to give children opportunity to examine geographic features and their interrelationships at levels of high perceptual support before their symbolic representations were presented. Materials included photographs, large, moveable three-dimensional models of the features and topography of each region studied, raised magnetic-based instructional models, large air photos, terrain models, and acetate-overlay map systems designed to demonstrate patterns of correspondence in distributions of geographic features.

Systematic practice was given in these programs to certain prerequisite skills found, in the developmental phase of this research, to be critical in achieving criterion performance on these analytic tasks. These skills included: (a) reading map symbols at levels of increasing abstraction, on maps produced at different scales; (b) reading the map grid, and locating places with reference to coordinates; and, (c) grouping "like" geographic features into a single set, a skill prerequisite to determining patterns of correspondence in distributions of two or more such sets within a region.

(7) This experimental teaching program was of sixteen weeks' duration and was offered in lieu of children's regularly scheduled social studies program.

Program B, the Generalizations-Centered Curriculum

Curriculum B was premised upon a different, but widely recommended approach to structure, and incorporated in its teaching objectives a core of geographic generalizations accepted by geographers as a statement of the tested knowledge of their field. These generalizations were presented to teachers as the "end-products" to be learned, under conditions of an inductive approach to classroom instruction.

This curriculum might be considered an experimental revision of the California Social Studies program, paralleling in certain important respects the 1962-adopted State Framework for the Social Studies (4).

With the adoption of the California Social Studies Framework in 1962, curriculum committees in the state culminated a seven-year long enterprise in curriculum revision. A unique contribution of these committees was their invitation to scholars within the social sciences to define major generalizations within their disciplines. These generalizations, subsequently edited and revised, are listed within the framework as a recommended resource to local school districts in planning the content of social studies instruction.

Twenty-seven such generalizations comprise the list for geography. While they are separated under the two rubrics, physical and cultural geography, no indication is made of priority among them. Teachers are cautioned to look upon these generalizations as end-products, "appropriate for application to adults rather than to a particular grade," and are advised to use them chiefly as a resource in selecting content appropriate for children. Guidelines to such selection are not offered, however, and the task is recommended to the local school. It was this task that provided the special emphasis in Program B, and assured that teachers, randomly assigned to this program, would perceive their assignment an important and special one.

Experimental Curriculum B of this research instructed teachers to work within their state and district-approved framework, but to give important emphasis in their planning to a selected number of geographic generalizations, formulated within the recently-adopted state framework, and intended as a resource for geographic instruction within the fused social-studies core.

For each grade three generalizations were selected. Each generalization incorporated the concept of areal association in the stated reference each made to relationships of physical and cultural factors in man's use of the landscape. This curriculum differed from Curriculum A by giving children examples of these generalizations in the form of a number of simple geographic relationships from which the more broadly stated generalizations could be inferred. Curriculum B did not give practice in the analytic processes by which geographers study the data of the landscape and determine relationships between features within it.

Teachers working within Program B were offering instruction in geography, therefore, but under a different organizing system. Teachers were instructed to work within the normal structure of the social studies, and to introduce into this program geographic learnings drawn from the newly adopted state framework for the social studies. Program B derived its special character from the emphasis it placed upon a new curriculum resource--the geographic generalizations within the state framework--and its enjoiner to teachers to seek implementation of those generalizations within their social studies core.

Curriculum B, like Curriculum A, centered first grade instruction in the neighborhood and its relationships with the wider community; second grade instruction in comparative studies of the extended urban-industrial complex; and, third grade instruction in historical antecedents of the local community. Curriculum B incorporated, at all three grades, the use of new maps, terrain models, films, self-instructional materials, and extensive, new field-study trips.

<u>Summary</u>--The critical features differentiating these two programs were the following:

(1) <u>The Curriculum Variable</u>

Program A was designed as an experimental new program, organized to give systematic instruction in the core concept and analytic methods of geographic theory. The curriculum, grades one through three, was centered in three different geographic environments, each selected as a center for illustrating the geographic concept of areal association.

Program B was an experimental modification of the California program. It was organized on the "expanding environment" curriculum model, and was designed to develop children's understanding of selected generalizations from geography. Teaching the content of the social sciences through the study of generalizations is one currently advocated method for improving learning in social studies. Curriculum B drew upon these premises, and used as its content source geographic generalizations from the California State Framework for the Social Studies.(4).

(2) The Instructional Variable

Program A was predicated on certain assumptions derived from research findings of Piaget, Wohlwill, Heidbreder, and Keislar. These findings suggest the validity of introducing causal systems--as in this core geographic concept--with strong perceptual support. This program used, therefore, specially designed instructional materials--models, topographic layouts, and maps, e.g.--to illustrate to children systems of interaction within the geographic complex.

Program B introduced supplementary instructional materials designed to assist teachers in their regular classroom programs. The scope of the geographic generalizations, identified within the state social studies framework, precluded attention to all. Those understandings which were deemed most relevant within the present social studies programs, grades one, two, and three, were selected, and materials provided to assist teachers in implementing them through an inductive instructional approach.

Both programs were developed over a sixteen-week period, with fifty minutes per day devoted to instruction. Each program was developed within the time of the normally scheduled social studies lesson.

The Hawthorne effect was controlled by the fact that teachers in both curricula perceived their programs as new, experimental ones, designed to improve instruction in geography. All had expressed interest in becoming part of the project. Teachers were randomly assigned to either program. Both groups, after assignment, received special instruction, through 2-week summer workshops, regarding the nature of their programs. Both received new instructional materials, relevant to their assignments, and both realized the continuing interest of the school district and project personnel in these programs throughout the experimental period.

Dependent Variable

The dependent variable in this research was children's achievement in geography, at each of three levels of cognitive operations and at each of three levels of symbolic abstraction. Achievement was differentiated, after Bloom's *Taxonomy of Educational Objectives* (1), to include the following three levels of cognitive performance: (1) Knowledge of geographic features and functions; (2) comprehension of the concept of areal association, the core concept of geographic theory; and, (3) ability to apply the concept of areal association in regional analyses of unfamiliar environmental complexes.

Hypotheses

The major hypotheses of this research were the following:[1]

(1) No significant difference will be found between groups enrolled in Curriculums A and B on criterion scales measuring knowledge of geographic terms, that is, of geographic features and functions.

(2) Subjects enrolled in Curriculum A will evidence significantly higher achievement, at all three grades, on criterion scales measuring comprehension (understanding) of the core concept of geographic theory.

(3) No significant difference will be found between groups enrolled in Curriculums A and B on criterion scales measuring ability to apply that concept appropriately in interpreting the data of unfamiliar geographic regions.

The null hypothesis was to be rejected at the .05 level of significance.

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[1] Hypotheses were also formulated for the smaller experimental researches conducted within the context of the larger research program. See Chapters IV and V of this report.

CHAPTER II

METHOD

Three major phases were involved in this research.

Phase I: Development and field-tryouts of the instructional programs, their teaching resources, and the criterion instrument.

Phase II: Classroom experimentation.

Phase III: Analyses of data and preparation of the project reports.

Developmental Phase I

The purposes of Phase I of this project were to develop the two instructional programs, their teaching resources, and the criterion instrument. This initial phase of the project was planned for the months February 1, 1964 to April 30, 1965, and involved the procedures described below.

Development of Program A

In developing the experimental instructional Program A, and its teaching resources, the following steps were taken:

(1) Identification of the major geographical concept, areal association, together with the specific geographic understandings contributing to its development.

A senior consultant, Professor Richard Logan, Geography Department, UCLA, provided authoritative assistance in defining and structuring the major conceptual system to be developed.

(2) Specification of the learning opportunities, grades one through three.

Instructional programs at all three grade levels focused on the same major geographic concept, areal association. However, at each of these grade levels, somewhat different geographical environments were under study. Therefore, the specific examples of areal association, introduced to illustrate the major concept, differed from grade to grade. Determining specifically: (a) what these examples would be; and (b) how they would be presented to children, constituted a second major step in program planning.

(3) Preparation of curriculum materials, for trial use in selected pilot classrooms.

In this phase of operations, instructional guides together with teaching resources were prepared. Guidelines to the development of these materials were available through the statement of instructional objectives directing this program, as well as in the principles, earlier described, concerning the use of object materials to illustrate, for young children, systems of interaction within a geographic complex.

Professional geographers and curriculum specialists worked jointly in developing these programs. The senior consultant in geography was involved on a continuing basis, to assure accuracy of the concepts presented, and of the instructional resources.

This instructional program was drafted over the period February 1964 to August 1964, with first-draft instructional guides and materials ready for field-testing in the fall semester, 1964.

(4) Field-testing of the proposed curriculum materials.

Three cooperating classrooms, grades 1, 2, and 3, were selected for pilot study. Classrooms were selected from the school district cooperating in the project. Tryout classrooms were equipped during this phase of the study with a range of instructional materials, including: selected models of community structures and facilities; topographic layouts representing land-use patterns; schematized representations of critical systems of interaction within the urban complex and its outlying environs; and maps, pictorial and symbolic in their representation of features of the region.

Tape recordings and observations were made at regular intervals to obtain records of the developing instructional programs, as well as children's responses to them. Conferences were sequenced throughout this period, with cooperating teachers and project personnel present. From these varied resources, suggestions for revision or extension of the programs were obtained, and, where appropriate, field tested in anticipation of their use in Phase II of this project.

Development of Program B

The regularly planned social studies core program provided the structure for instructional Program B. However, assistance was given to acquaint teachers with the generalizations from geography listed in the Social Studies Framework for the Public Schools of California, and with an inductive instructional approach. For this purpose a teaching manual was prepared, identifying those generalizations, and suggesting some appropriate instructional materials for children's use. Since this program was not solely a curriculum in geography, and these materials were to be introduced within the structure of teachers' regularly planned social studies programs, this task was not the extensive one involved in planning for Program A.

One differentiating feature of this generalizations-centered curriculum B was the "inductive" instructional approach teachers were asked to use. Generalizations were considered the "end-point" of instruction, and were to be formulated by the children, under teacher guidance. The instructional approach and the examples to be used in facilitating these learnings were planned with the teachers in Program B at each of grades one, two, and three.

Development of the Criterion Instrument

The lack of an instrument for measuring achievement in geography at the primary level made necessary the development of a criterion instrument. The development of the instrument was coterminous with program development in Phase I of the project.

The criterion instrument was designed, with three sub-scales, to test children's achievement in geography. Specifically, the criterion variables included:

a. Knowledge of geographic features and functions, and their symbolic representation on maps.

b. Comprehension of the geographic concept of areal association, applied to urban environments and the natural landscape.

c. Ability to apply a major geographic concept--areal association, the core concept of geographic theory--in the analysis and explanation of events within unfamiliar environmental complexes.

Procedures involved in initial test construction, item analysis, and refinement of the scales were conducted during Phase I of this project, with pilot classrooms serving as the principal try-out groups.

Test reliability was estimated by computing split-half correlations. Items were randomly assigned to each half-test in a manner assuring that each would conform to specifications for the total test. Total test reliability was estimated from the part-test correlations, through application of the Spearman-Brown formula.

Experimental Phase II

Design

The purpose of Phase II of this project was to subject to experimental test the hypotheses directing this research. For this purpose, a treatments-by-levels design was employed, in which levels corresponded to grade categories (grades one, two, and three) and treatments were defined as Programs A and B.

Twelve intact, self-contained classroom groups served as the sampling units of this research.

Subjects were children regularly enrolled in these intact, graded classrooms at each of three grade levels: first, second, and third. Intact classes served as the sampling unit, and were randomly assigned, at each grade level, to either of the two instructional programs. For this purpose, four classes were selected at each grade level, and randomly assigned to Programs A and B as indicated in the table below:

	PROGRAM A	PROGRAM B
Grade 1	2	2
Grade 2	2	2
Grade 3	2	2

Enrollments in the twelve classrooms varied from group to group, with class averages about thirty pupils, each. Class means were weighted equally in the treatment of data.

Programs A and B were administered simultaneously, at all grade levels, for a period of 16 weeks. Teachers were asked to develop these programs within their regularly scheduled social studies period. Children, therefore, received instruction in the experimental programs to which they had been assigned for a total of approximately fifty minutes daily, at all grade levels.

To obtain data for statistical control of certain concomitantly operating variables, pupils were pretested for IQ and initial achievement on the criterion instrument. Post-test administration of the criterion instrument to all pupils was conducted approximately three weeks after conclusion of the experimental programs. The criterion instrument was administered individually in grades one and two, and to small groups in grade three, with impartial test administrators instructed in testing and scoring procedures. None of the testers was apprised of the instructional program which their groups had received. Further, every caution was taken to prevent teachers' involvement with the instrument prior to their development of the instructional programs.

Subjects

The population was elementary school children of first, second, and third grade classes in certain large, public metropolitan elementary schools of Los Angeles County. Los Angeles County incorporates ninety-six school districts, eighty of which presently include elementary school units. Districts within the county range in size from the three smallest, enrolling less than three hundred students each, to the Los Angeles City Unified School District, exceeding, in its total enrollment, 500,000 students. Elementary school enrollments in the county, October 31, 1962, totaled 743,244. Of this total, 330,944 pupils were enrolled in grades one through three.

Solicitation of schools within this area was to be made in part on criteria of: (1) geographic accessibility; and (2) interest on the part of administrative personnel in this project. In addition, however, we wished to obtain a sample as representative as possible of certain population and socio-economic characteristics normatively defining the county as a whole. Data were obtained of current population characteristics of Los Angeles County, as a whole, and of its component Study Areas, delineated by the Research Department of the Welfare Planning Council, Los Angeles Region (26). The Study Areas each compose a group of Census Tracts, grouped on criteria of (1) population homogeneity, (2) municipal and physical boundaries, and (3) comparability with recognized geographic units within the County. Homogeneity was each time determined on criteria of average rent, racial composition, marital status, and age composition.

The Santa Monica Unified School District within Los Angeles County incorporates three of these Study Areas: Malibu, North Santa Monica, and South Santa Monica. Table I summarizes 1964 population and family income data for Los Angeles County and for the three Study Areas served by the Santa Monica Unified School District. Both median income and distribution of income groups within Santa Monica and within Los Angeles County as a whole are correspondent.

Table II presents data concerning distribution of minority groups in Los Angeles County and in Santa Monica, by Study Areas. Close correspondence may again be noted in these distributions between the South Santa Monica and the Los Angeles County means. Table III presents data on socio-economic and housing characteristics by race and ethnicity in Los Angeles County as a whole and for non-white population in South Santa Monica. Reasonably close correspondence between the County and South Santa Monica means is again observed.

On the basis of these data, the region served by the Santa Monica Unified School District was judged to meet the criterion of being reasonably representative of mean population characteristics of Los Angeles County as a whole. The district, in addition, met admirably well our remaining selection criteria.

Santa Monica is geographically close to the University of California, Los Angeles campus, where the research staff was to be housed. Administrative personnel in the Santa Monica Unified School District were highly interested in participating in the project, and offered complete support for the developmental and experimental activities this research would require.

Solicitation of teachers within schools was first made through building principals and supervisors. To control for systematic differences between groups due to teaching variables other than the critical treatment factor, teachers were first selected on the following criteria, and then randomly assigned to either instructional program.

(1) Teacher Effectiveness. Teachers were selected from among those rated as effective by their building principal and district supervisor. These teachers all had at least two

TABLE I

FAMILY INCOME IN LOS ANGELES COUNTY AND SANTA MONICA, CALIFORNIA[1]

Region	No. of Families	% under $4,000	% $4,000 -5,999	% $6,000 -7,999	% $8,000 -14,999	% $15,000 and over	Median Income
Malibu	3,098	15.3	11.6	17.1	35.4	20.7	$8,745
North Santa Monica	9,964	17.7	17.4	16.5	34.8	13.7	7,816
South Santa Monica	12,870	24.1	22.3	21.9	28.2	3.6	6,309
Total Santa Monica	25,932	20.5	19.1	19.2	31.5	9.5	7,179
Los Angeles County	1,565,603	19.1	19.1	21.6	32.4	7.8	7,046

[1] Data obtained from Background for Planning, Research Report No. 17, Research Dept. Welfare Planning Council, Los Angeles Region, 1964, pp. xxxvi-xxxix.

TABLE II

DISTRIBUTION OF MINORITY GROUPS IN
LOS ANGELES COUNTY AND SANTA MONICA, CALIFORNIA

Region	1960 Total Population	% Negro	% "Other" Races	% Spanish Surnames	% All Minorities
Malibu	12,396	-	-	-	2.8
North Santa Monica	35,315	-	-	2.1	2.1
South Santa Monica	47,934	8.3	2.0	9.2	19.5
Los Angeles County	6,038,771	7.6	2.0	9.6	19.2

TABLE III

CHARACTERISTICS OF POPULATION BY RACE AND ETHNICITY, LOS ANGELES COUNTY AND SOUTH SANTA MONICA, 1960

Total	Anglo-White	Non-White		Spanish Surname
	Los Angeles County (N=4,877,150)	Los Angeles County (N=584,905)	South Santa Monica (N=3,665)	Los Angeles County (N=576,715)
Socio-economic Characteristics				
Median Income	7,433	$5,157	$5,507	$5,759
Median School Years Completed	12.2	11.1	10.6	9.0
Housing Characteristics				
Per Cent Owner Occupied	56.6	40.6	31.3	47.0
Median value of owner occupied units	$16,900	$12,900	n.d.	$13,100
Median Gross Rent	$85	$72	$86	$68

years of successful professional teaching experience at the primary level.

(2) Teacher Interest and Willingness to Participate in the Project. Teachers qualifying under condition 1 were approached concerning their interest in participating in this project. They were informed of the nature of the project, an experiment in the teaching of geography to young children. They were informed that the class of each teacher participating in the study would randomly be assigned to either of two instructional programs. They were told that teaching manuals, instructional materials, and equipment needed for the programs would be provided for them; and that pre- and post-tests would be both administered and scored by research assistants assigned to the project. Teachers, finally, were informed of the need for their attendance at a series of planning sessions, where the instructional method and the newly developed materials would be presented and explained.

On the basis of their interest, teachers were selected, four at each grade level, and then randomly assigned to either of the two instructional programs. Because of the pool of teachers available for this research, it was possible to preselect teachers so as to include no more than one classroom at any given grade level at any one school. This precaution was important as a means of preventing contamination between programs, through teachers' inadvertent informal conversations or sharing of materials.

Table IV provides data on the distribution of participating classrooms over the three study areas of the region served by the Santa Monica Unified School District.

After classrooms were randomly assigned to Experimental Programs A and B, classroom groups were distributed by regions as illustrated in Table V.

Table VI presents descriptive data on the pupils in each intact classroom group.

Teacher Competence

As already explained, all teachers participating in this research, under both Programs A and B, were preselected for their recognized competence and experience, as judged by administrative and supervisory personnel within their school district. In addition, teachers included in the two experimental groups had expressed interest in participating in the project, and were favorable to the

TABLE IV

DISTRIBUTION OF EXPERIMENTAL CLASSROOMS (A AND B), BY GRADE AND SOCIO-ECONOMICALLY DEFINED REGIONS

	Grades		
	1	2	3
Malibu region (Median Income $8,745)	1	-	-
North Santa Monica (Median Income $7,816)	1	1	1
South Santa Monica (Median Income $6,309)	2	3	3
Totals	4	4	4

TABLE V

DISTRIBUTION OF EXPERIMENTAL CLASSROOMS A AND B, BY SOCIO-ECONOMICALLY DEFINED REGIONS

	Program A (geography-centered)	Program B (generalizations-centered)
Malibu region (Median Income $8,745)	1	-
North Santa Monica (Median Income $7,816)	-	3
South Santa Monica (Median Income $6,309)	5	3
Totals	6	6

TABLE VI

DESCRIPTION OF SAMPLE

Class	N	Chronological Age		I.Q. Score	
		M	Range	M	Range
11	21	6-3	6-2 to 6-10	112.7	79-130
12	27	6-3	6-0 to 7- 0	99.1	76-125
13	28	6-4	5-8 to 6- 9	104.6	71-128
14	22	6-3	6-1 to 7- 0	115.6	92-139
Total	98	6-3	5-8 to 7- 0	113.3	71-139
21	27	7-3	7- 0 to 10-2	106.8	80-126
22	24	7-4	6-10 to 8-7	92.3	52-124
23	21	7-3	6-11 to 8-7	101.3	75-117
24	29	7-6	6-10 to 8-4	112.1	86-140
Total	101	7-4	6-10 to 10-2	103.0	52-126
31	31	8-3	7- 9 to 9-1	94.2	72-121
32	24	8-7	7- 8 to 9-9	98.2	84-131
33	22	8-6	7-10 to 9-4	96.9	70-120
34	27	8-4	7-10 to 9-5	111.4	93-135
Total	104	8-6	7- 8 to 9-9	100.0	70-135
Total All Grades	303	7-7	5-8 to 10-2	105.1	52-139

demands which would be made upon them for attending an initial summer training workshop, as well as regularly scheduled, weekly conferences throughout the research period.

The solicitation of teachers and their assignment to Programs A and B was completed in the spring semester of 1965. Sufficient time was available, therefore, for the intensive training workshops, conducted the following summer, the delivery of instructional materials, and the pretesting of children that following September.

During the summer term preceding the experimental period, all teachers were enrolled in one of two training workshops, directed by the project director and staff. Workshops were held in June for Program A and in early September for Program B. Program A, which required the more intensive and long-term education of teachers in the new objectives and analytic teaching methods of that program, was conducted for five hours daily over a period of two weeks. The Program B workshop was held over a period of three days, and focused on the inductive method and geographic generalizations to be developed in that program. Throughout the 16 weeks of the experimental period, Programs A and B teachers met weekly in two separate groups with the project staff for continuing assistance in their separate programs.

Teacher morale under both programs was high. The school district granted credits for professional advancement within the district for attendance at the workshops and the continuing training sessions. Teacher attendance, throughout, was remarkably high, with only two absences occurring over the entire series of meetings. Teachers under both programs realized the high interest of their school administrators and supervisors in the experiment. Administrators and supervisors attended all workshop sessions, and facilitated the development of both programs.

Statistical Analyses

The major statistical treatment employed in this research was analysis of covariance, with statistical adjustment made for the effects of pupils' pre-instructional achievement in geography, as determined by pretest performance on the criterion instrument. Intercorrelations were computed for pupils' mean IQ, pretest, and posttest achievement. On the basis of these data, pretest scores were selected as covariance controls in adjusting the final criterion scores. Analysis of variance was applied to the adjusted criterion measures, and F-tests used to test the significance of the treatment difference at each grade level, for each level of geographic achievement (knowledge, comprehension, and application).

CHAPTER III

THE EXPERIMENTAL CURRICULUM A

Three major steps were involved in designing the curriculum. They included (1) defining instructional objectives for a program in geographic education, derived from an analysis of geographic method as a data resource; (2) organizing the curriculum--that is, selecting the learning opportunities and determining the sequence of activities in which children would be engaged over the course of the 16 weeks' experimental program; and (3) developing the instructional resources to be used.

Determining Instructional Objectives

The research purpose of Curriculum A established the framework in which its instructional objectives were to be derived. The purpose of this experimental Curriculum A was to provide children some beginning opportunities in geographic thinking, through practice in applying the central, organizing concept of geographic theory to the analysis of geographic data. This purpose was consistent with the nature of geographic method, in which regional analyses are engaged in for purposes of explicating problems or cause-effect hypotheses concerning man's occupance of regions; and, it was consistent with certain predispositions in children's learning, in the sense that children's energies are strongly directed during these years to seeking order, meaning, and control in the larger physical and social world into which they are moving.

The Nature of Geographic Inquiry

Geographers are primarily concerned with the study of place. Places differ, over the earth. Those differences occur as the result of a number of forces, unevenly distributed, and operating, therefore, in differiig patterns of relationship to one another. Physical processes, involving the land and water resources of a place; biotic processes, resulting in complex and intricate relationships between a particular land base and the plant and animal life sustained there; and, the cultural processes whereby man occupies, adjusts to, and changes the land--all these processes together interact to form the unique character of any given place.

Complicating this picture is the fact these forces operate at different rates, at different times, in different places on the earth's surface. Any particular place, therefore, is an expression of the unique patterning these forces--physical, biotic, and cultural--have created in the geographic landscape. The features of the landscape--its distribution of physical and biotic resources, and the unique patterning of man's works upon that land--constitute, therefore, the temporary character of a place and serve as the data for geographic analysis and interpretation.

In these tasks of analysis and interpretation, the geographer begins, first, with observation and recording of these features, as they occur upon the land. From these data the geographer draws his analyses concerning the unique patterning of the region. He infers, and tests, accordant relationships between geographic features, as they distribute over the landscape; and he draws inferences concerning causal relationships, as he is able to substantiate their development over time.

In these tasks the geographer may take a regional approach, and center his inquiry in the features of a given area. His purpose in this case is to explain the particular complex or association of features which together give character to the area. He may, on the other hand, take a topical approach, and focus his inquiry on the distributions of particular phenomena only--climatic or vegetation regions, e.g.,--and processes associated with them. In this case his approach may be problem-oriented, directed to specific questions of cause and effect, or to patterns of association between certain features, only, as they distribute over the landscape --microclimates in regions of ridges and valleys, for example; or, perhaps, the distribution of vegetative types in those microclimatic zones. In either case, the geographer's special concern is in delineating patterns or associations of features, and explaining their areal or spatial distributions over the earth's surface.

In these operations the geographer may draw upon the systematic studies of physical and social scientists--those concerned, for example, with studies in zoology, geology, or meteorology; or, in anthropology, economics, or political science. But, he alone is concerned with the analysis of these features, as they occur in association with one another, in specific places, under conditions where other features are not found equal. If the economist, the sociologist, or the political scientist seeks the universal in model building, it is the geographer, in his regional approach, who gives critical test to the applicability of the model, under conditions where other features are not found to be constant.

The Methods and Tools of Geographic Inquiry

Concept of Region. The basic concept in geographic method is the concept of the region. Regional method in geography refers to defining a precise area for study on criteria which accomplish two things: (1) which maximize homogeneity of features within a given region; and, (2) which maximize contrasts between that region and its its surrounding or bordering areas, again in terms of the particular features under study.

Delineating the region, it should be clear, is a matter of definition. There is no one system of regions, but many, depending on the research purposes of the geographer. The regional concept is a convenience, only--a method for maximizing homogeneity in the complex of features to be studied, hence giving the geographer the best possible instance or laboratory for the thing being studied.

Regions for some purposes may be large. For most purposes, a region will be considerably more circumscribed, depending on just how specifically the particular association of features under study is defined. Generally, limitations on the size of the region are a function of the value of the generalizations which can be drawn concerning them. Regions so small as to be characterized by near complete homogeneity within their borders prove of limited value in systematic study and classification of the earth's surface. Except as there are similar places, elsewhere available for comparative study, generalizations concerning the area are neither possible nor verifiable. Science does not proceed on infinite numbers of cases of one. Geographers, purporting to scientific advance, seek the knowledge that generalizes, and can, therefore, be tested, refined, and extended under new conditions where the critical features occur, again, in similar patterns of relationship.

Geographers, it is true, stress the uniqueness of places in their definition of regions, and in their researches into the particular associations of features and processes which together give character to places. But geographers also identify similarities between regions. It is those similarities, found to obtain despite variations in other features of a total regional complex, which make possible geographic generalizations.

Such generalizations, supported by critically examined field data from comparative regions, furnish the core of geographic knowledge. Such generalizations are, of course, open to systematic review and reformulation. New data, new methods in geographic research, both hold the potential for generating revision in theory, and in the body of generalizations now found widely supported by evidence presently before the field.

Concept of Areal Association. The central concept in geographic theory is the concept of areal association. Regions differ precisely because features are unevenly distributed over the earth's surface. Any given place obtains its character from the particular association of features found there. It is these associations of features, studied for their origins (causal, over time) or their present relationships (the particular associational or accordant nature of a complex of features) that furnish the subject matter of geography.

Patterns of areal association may be studied as phenomena interrelated in place--particular associations of urban features and their relationships within functionally defined regions of a city, for example. Patterns of areal association may also be studied as phenomena functionally interrelated between places--patterns of spatial interchange of people and goods, within and between cities, for example; or, as a second example, effects of transportation arteries on urban-industrial spread. Patterns of areal association may also be studied as phenomena operative over time--the <u>comparative</u> effects of three separate periods of human occupance of a region, for example; or, the <u>cumulative</u> effects of processes and forces accounting for change in present land-use patterns within a region.

<u>Geographic Method</u>. Within this basic framework, geographers may focus on either of two approaches. The geographer may select a region for systematic analysis, encompassing in his inquiry patterns of distribution and accordance of physical and cultural features associated within that region. Urban complexes, studied in terms of their internal structure are one such example. Culture-regions are another. The geographer may, on the other hand, define a region in terms of the particular association of features he wishes to study. Examples are regions defined by soil type, or by distributions of microclimates in a region of ridges and valleys and the vegetation associations found there. For these purposes, regions are more narrowly defined, sometimes in terms of single features, sometimes in terms of associations of features (soil types, e.g., or certain patterns of land use).

Mapping or cartographic analysis serves as a critical tool in both investigations. In the second instance, however, cartographic analysis plays a critical role in testing and verifying assumptions concerning the problem under study. Distributions of the critical features are mapped, and compared with distributions of features presumed related. Patterns of correspondence in spatial distributions of two or more features are analyzed; and when appropriate, causal relationships are verified through recourse to data of changes accruing over time.

Implications for Curriculum. This duality of approach in the methods of the scholar in itself raises no problems in curriculum-making other than one of focus. Both approaches contribute systematically to the development of geographic knowledge. Both make use of the regional concept. Both require understanding of concepts of areal differentiation and association as they relate to features of the landscape. Both require competence in the critical mapping and analytic skills of professional geography.

The choice of focus largely is one of resolving the question: which of these approaches affords the young child, within the research environment the school is able to provide, opportunity to engage directly in the operations and methods of geography--and does so under conditions which bring that discipline into negotiable relationship with the young child's past fund of experiences and present dispositions toward structuring his world. Arguments could be made for either approach. This research selected the regional approach to the study of an urban complex.

A Model of Geographic Inquiry

Once the regional approach, together with the organizing concept of areal association, was selected as the central data source for the experimental Curricula A, there still remained the problem of differentiating between the analytic processes which direct geographic inquiries, and the knowledge claims (the generalizations) those inquiries produce. This task was critical for differentiating between instructional objectives of Curricula A and B. It was critical, also, as a step in clarifying what is presently confusion concerning the meaning of "structure" as applied to the discipline of geography.

Figures 1 and 2 were developed in order to clarify the operations of geographers, and the relationships between their analytic methods and the geographic generalizations those inquiries produce. Figure 1 presents what in this research we differentiated as the procedural and categorical concepts of the field. Figure 2, which might best be perceived as an "overlay" to Figure 1, demonstrates, for each of the concepts of Figure 1, the nature of the analytic tasks correspondingly engaged in.

Within this model, geographic inquiry begins with (1) definition of the region under study. The "region" is an abstraction, the outcome of defining a precise area for study on criteria which accomplish two things: (1) which maximize homogeneity of features within the boundary; and (2) which maximize contrasts between that region and its surrounding or bordering areas, again in terms of the particular features under study. Delineating the region is a

Figure 1.

A MODEL OF GEOGRAPHIC INQUIRY

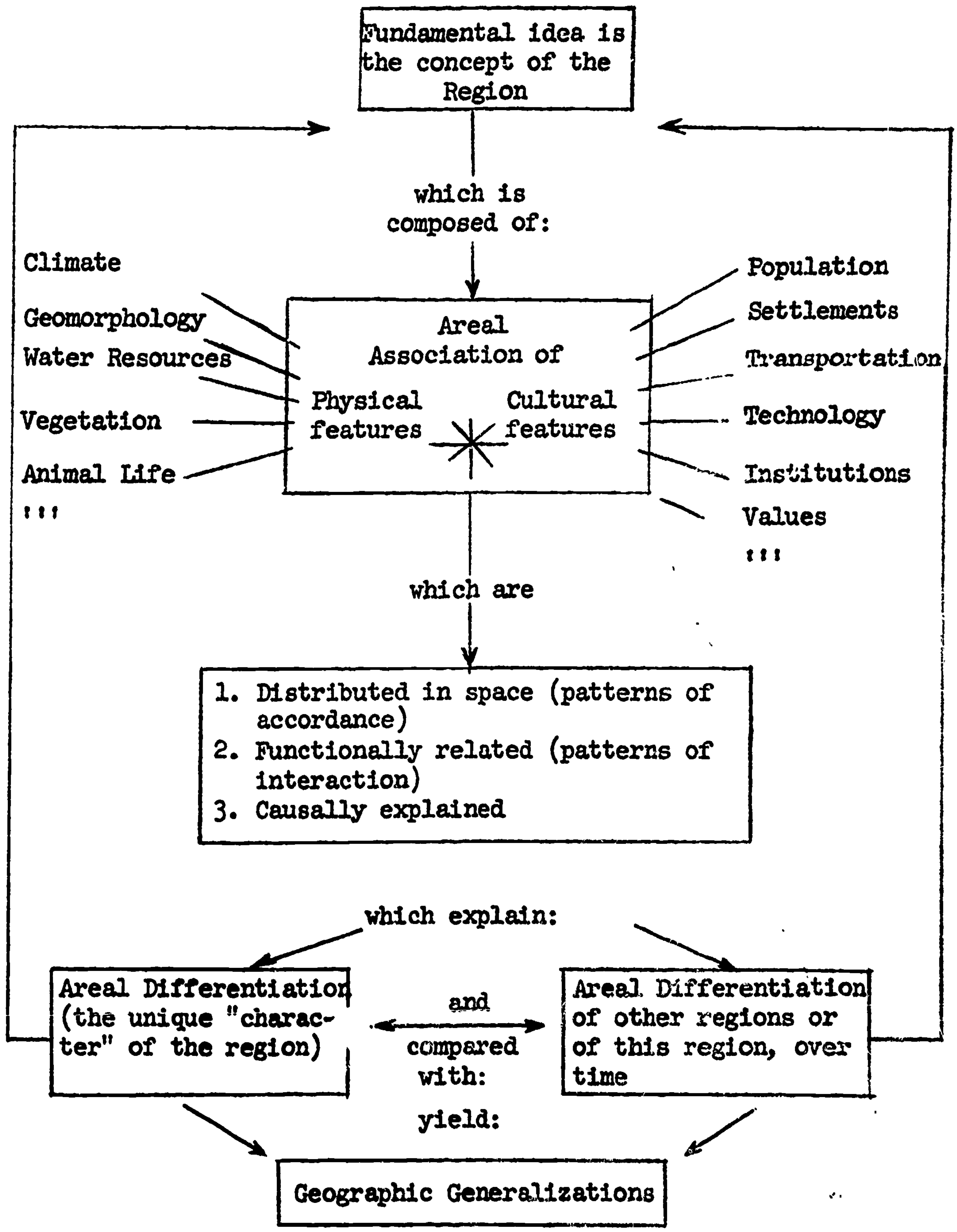
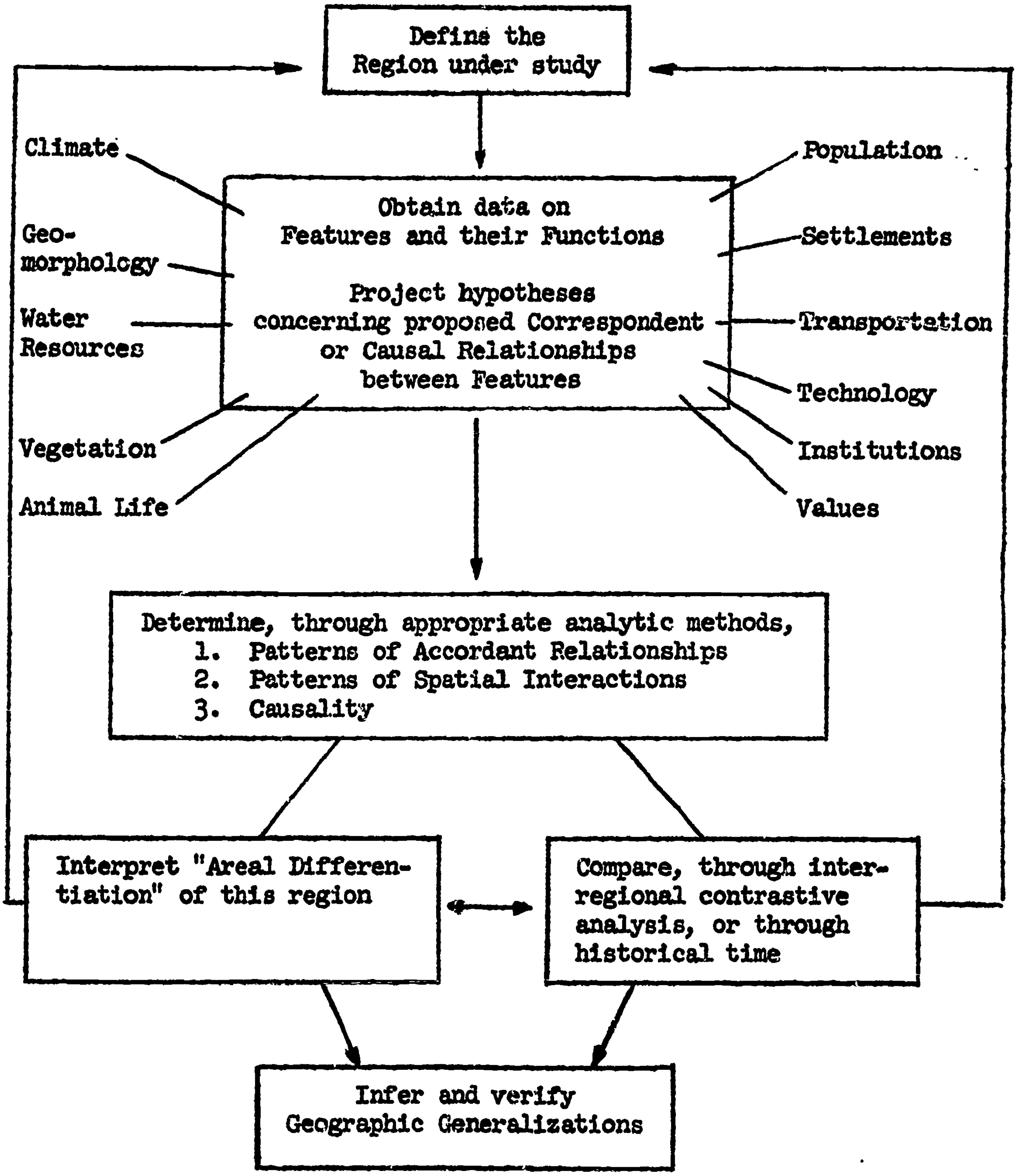


Figure 2. A Model of Geographic Inquiry: Associated Geographic Operations



matter of definition. In our research, we selected for study the region defined as the "urban-industrial complex of greater Los Angeles." This is a region defined in terms of a complex system of interrelationships--economic, political, and cultural--which transcends individual city boundaries, and which incorporates an array of micro-climatic zones and landforms. Yet, the "character" of the region is distinctive, in the present-day land-use and the historical antecedents the region shares in common.

Geographic inquiry continues with (2) examination of particular physical and cultural features distributed within the region. Step 2 involves processes of data gathering--of locating features and, in the case of cultural (man made) forms, determining the function(s) each serves. Beyond obtaining information concerning what features are present, geographers also seek (3) understanding of patterns of areal association within the region; i.e., patterns of relationship (functional, correspondent, or causal) between features, present or past. Such patterns of areal association may be studied as phenomena interrelated in place. In this case, geographers seek explanation concerning how features are distributed and how those distributions are related to distributions of other features within the region. Are those distributions "correspondent?" Do they overlap? Locating patterns of correspondence (between micro-climates, soil type, and vegetation patterns, e.g.; or between settlement patterns, economic factors, and the system of freeways extending a region) points up "regularities" in a region, explains something about its character, and permits predictions concerning future development and the consequences of proposed land-use.

Geographers also study patterns of areal association in terms of phenomena functionally interrelated between places. They may, for example, study patterns of spatial interchange of people and goods, within and between cities; or, as a second example, effects of transportation arteries on urban-industrial spread. Patterns of areal association may also be studied as phenomena operative over time. In this case, geographers may study the comparative effects of three separate periods of human occupance of a region; or the cumulative effects of processes and forces accounting for change in present land-use patterns within a region.

In developing any or all of these analyses, geographers seek (4) understanding of the unique character of the region under study. They also seek (5) generalizations concerning similarities between regions. Similarities, found to obtain despite variations in other features of a total regional complex, make geographic generalizations possible. These generalizations furnish the core of geographic knowledge. They are, of course, open to systematic review and change. New data, new methods in geographic research, both hold potential for generating revision in theory, and in the generalizatons now widely supported within the discipline.

Procedural and Categorical Concepts in Geography

In considering Figures 1 and 2 as a diagrammatic statement of geographic method, the reader might note that certain concepts of Figure 1 generate more powerful inquiries than do others. These concepts we have classified as procedural (inquiry-directing) concepts and as categorical concepts. Both are useful in organizing geographic data and explaining regions. Their differences are demonstrated below.

Categorical concepts we define as categories or classes of geographic forms (elements or features) and their functions. They include, for example, all physical and cultural geographic elements and associations classifiable under the following categories. The inquiries they initiate are, for the most part, descriptive and taxonomical.

Physical: Landforms, including mountains, plains, valleys, delta, mesa, costal strand, island, etc.

Soil Types

Mineral Resources

Vegetation, including plants classified under the following plant associations: coastal sage, riparian, chaparral, oak parkland, and "introduced"

Water Resources, including ocean, bay, river, spring, water table, etc.

Climate, including wind systems, climatic types, micro-climatic zones, precipitation, etc.

Animal Life, including associations found in coastal, mountain, desert, grasslands, and ocean regions.

<u>Cultural</u>:	<u>Population</u>, including such factors as size, composition, and "productive potential"
	<u>Settlements</u>, including features classified into residential, commercial, industrial, administrative, recreational, and agricultural regions.
	<u>Circulation systems</u> (transportation and communication)

<u>Procedural concepts</u>, on the other hand, assume relationships between the data of the environment. Procedural concepts are demonstrable not by object-referents, but by inference. Patterns of causality or correspondence, for example, can be assumed to be verified only to the degree the data support, beyond reasonable or statistically significant doubt, the inference that such relationships do exist. The value of these procedural concepts accrues from the fact they generate, to the initiated, powerful inquiries. Taken in sum, these concepts serve to explain the nature of "areal association," and thereby describe the unique character of any region.

A statement of selected procedural concepts and their related inquiries is presented below:

<u>Localization, position, site, situation</u>:	A cluster of related concepts concerning where a factor is located and in what spatial relationship to other geographic factors.
<u>Distribution, density, mobility</u>:	How are these features distributed? With what density? With what degree of mobility?
<u>Accordance</u>:	Do these distributions overlap? Are they "spatially correspondent?"
<u>Interaction (including distribution, exchange)</u>:	Are these distributions functionally related? Are they interrelated within or between regions?

Causality:	How were these distributions caused? What were their antecedents? What processes of change are underway?
Differentiation:	How is the particular association of features of this region unique? How does its "character" influence other features?

The central organizing concept of geographic theory, the concept of areal association, subsumes all of the procedural concepts just listed. Areal association has been identified by James (13) as the core around which geographic theory is built. Examples of areal association can be demonstrated by instances of causal or covariant (accordant) relationships between geographic factors, as they occur (1) within regions, (2) between regions, or (3) over successive periods of human occupance. The specific focus of the of the geographer's inquiry (whether focused upon phenomena within regions, between regions, or over time, and whether causal or correspondent) will depend upon his research interest or upon the social, economic, or political problem demanding his attention. The specific procedural concepts he employs follow from the decision he makes concerning the focus of his inquiry.

Inquiries into phenomena interrelated in place, for example within the Los Angeles urban-industrial complex, might involve concepts such as position, site, situation, distribution, and accordance. Inquiries into phenomena functionally interrelated between places might examine such problems as effects of urbanization on the agricultural landscape, or effects of transportation arteries on urban-industrial spread. Such inquiries would more often make use of the concept-clusters of (1) spatial interaction and distribution, or (2) causality and change. Finally, inquiries into phenomena operative over successive periods of human occupance would utilize concepts of causality, as well as any of the foregoing concepts, useful in analyses concerning any given time period in the sequent occupance of the region.

This curriculum research, in selecting "areal association" as the central concept-system for study, allowed considerable latitude for developing concept-examples with children. Limitations on the selection of concept-examples were imposed, of course, by our ability to provide concrete referents for children for the concept-system we wished to illustrate. They were further imposed by the focus of each experimental curriculum.

The first grade Curriculum A, for example, was centered in functional studies of children's immediate neighborhood, and of its relationships to other places within the urban complex. Emphasis, therefore, was given to examples of areal association between geographic phenomena interrelated "within-place" (the urban area).

The second grade Curriculum A engaged children in inquiries into the extended urban-industrial complex, with emphasis on patterns of association between geographic phenomena functionally interrelated "between places." Second grade examples of "areal association," therefore, introduced the procedural concepts of spatial interaction, distribution, causality, and change.

The third grade Curriculum A introduced historical studies of sequent occupance within the region, with emphasis on factors accounting for change in distributions of geographic features, over time. Procedural concepts of causality and change were, of course, central to these areal analyses.

These curriculum decisions were reached, in part, because they somewhat closely corresponded to the "expanding-environment" model of the Curriculum B rationale. They also were made because, on the basis of preliminary estimates, they seemed to represent a sequence of increasing complexity in the analytic operations they required of children.

Analytic Processes Involved in Geographic Inquiries

The purpose of this research was to test the effects of instruction in the central organizing concept of geographic theory, and in the skills of applying that concept in the analysis of geographic regions. Curriculum A was designed to give systematic instruction in that concept (the concept of areal association), together with practice in the associated analytic processes of geographic method.

Goodlad (7) has noted that instructional objectives include both substantive (conceptual) and behavioral (process) elements. In the case of Curriculum A, our substantive and behavioral elements were both derived from the data source of geography. The central, organizing concept of geographic theory provided the primary substantive data source. The analytic processes of geographic inquiry provided the primary behavioral data source.

The analytic processes of geographic method, it has already been noted, are not entirely unique to the discipline. They are processes shared by all scholars engaged in the analytic mode of inquiry in the social and the physical sciences. Disciplines differ, of course, in the data acquired, and in the focus of their inquiries. Analytic tools (the air photo in geographic research, for example) are also specialized, and often unique to the field. The underlying inquiry processes (the cognitive operations), however, are alike, and do permit transfer between fields.

To point up the relationships between these basic analytic processes shared by the social and physical sciences, and their particular application in the case of geographic inquiries, we have prepared Figure 3. This chart demonstrates a sequence of geographic operations (column 1), generally agreed upon by geographers as the method of systematic, regional inquiries within their field. Column 2 presents the analytic processes engaged in, for each stage in geographic inquiry.

Obtaining data of the geographic elements (forms) and their functions within a region is largely conducted through processes of observation. In the analytic mode, observation is selective, and focuses upon what is geographically relevant within the larger regional surround. Observation may be direct, through field study and consultation with "informants" in the field. It may be mediated, through recourse to primary historical documents, maps, air photos, or statistical presentations. What facts are observed and recorded are determined, of course, by the research purposes or inquiry-focus of the geographer.

Recording observed data usually involves measurement, through calculations of number, frequency, density, arrangement, and/or distribution of geographic features within space, or through specified periods of time. Geographers frequently employ cartographic methods in recording their data, but increasingly employ mathematical models as well as graphs, charts, and descriptive statements of the phenomena studied.

Classification as an analytic process basically involves the constructing of classes or categories into which observed data are then subsumed. Taba, in an earlier research, included in classification operations both the behaviors of grouping (on like criteria) and of categorizing, subsuming (into hierarchies of super- and subordination), and labeling (naming and communicating). Observation of data may lead to the invention or construction of new concept-categories, or sub-categories, constructed as inquiries proceed and as more heuristic ways of classifying data are developed.

Contrastive analysis engages geographers in comparing categories, distributions, or associations of features. Figure 2 proposes three basic analytic operations in geographic inquiry. They are reproduced as operations 3, 4, and 5 of Figure 3. Analysing patterns

Figure 3. Relationships Between Geographic Operations and the Analytic Processes Involved.

GEOGRAPHIC OPERATION	ANALYTIC PROCESSES INVOLVED
1. Region is defined. 2. Forms or structures within the region are functionally analyzed. Cultural features are defined. Their functions analyzed.	Observation (Data Gathering): Acquiring specific information concerning geographic features and their functions within the region. Involves: (1) Acquiring knowledge of specific geographic features in the region; (2) Acquiring knowledge of functions of specific cultural features in the landscape.
3. Spatial arrangements and patterns of interaction within the region are mapped and analyzed. (Accordant relationships tested.)	Classification: Organizing information into constructed geographic categories, to describe and categorize phenomena observed.
4. Systems of functional relationships between this region and other regions are examined. 5. Time sequence in the region, past and present, is examined. (Causal relationships tested.)	Contrastive Analysis: Analyzing data in terms of patterns of distribution of features. Involves: (1) Applying concept of areal association in delineating functionally differentiated regions. (2) Determining patterns of accordance in the distributions of features within the region. (3) Determining causal relationships within the region as the consequence of changes through time.
6. Comparative regions are analyzed, and generalizations formed.	Generalization and Inference (through regional interpretation and theory construction): Structuring, verifying, and evaluating hypotheses and geographic principles. Involves:

Figure 3. Relationships Between Geographic Operations and the Analytic Processes Involved.

(cont'd)

GEOGRAPHIC OPERATION	ANALYTIC PROCESSES INVOLVED
	(1) Formulating appropriate hypotheses, and modifying on basis of data. (2) Structuring revised statements of geographic principles or generalizations. (3) Applying criteria of internal consistency and accuracy of the facts in evaluating statements of principles or generalizations.

of accordance (correspondence in the spatial arrangements of two or more features in the region) is an example of "within regions" contrastive analysis. Analysing systems of functional relationship or spatial interaction between regions (a port city and its hinterland, e.g.; or, the Central Business District and suburban residential neighborhoods) are examples of "between-regions" contrastive analysis. Analysing time sequence and determining patterns of causality is an example of historical or sequent-occupance contrastive analysis.

Generalization involves processes of generating hypotheses, testing, and structuring revised theory-statements or geographic generalizations. These activities grow out of wider contrastive analyses between regions. (Figure 2 demonstrates their occurrence in the inquiry sequence.) They grow not out of the simple instance but out of similarities observed through contrastive analyses of selected regions, or of a region, observed over time.

Inference is the process of submitting present knowledge claims or generalizations to further test. If a given knowledge claim, acquired on the basis of the limited data so far available, is valid, then it should follow that further instances or generalizations could be predicted and tested against the facts they predict. The critical test of the validity of generalizations is obtained through the evidence of how well further generalizations, logically deduced from the premise or knowledge-claim, are supported in fact.

These analytic processes defined in Figure 3 represent a continuum not dissimilar to that defined by Bloom et al (1) in their Taxonomy of Educational Objectives. Viewed as a continuum, levels 1 and 2 of the scale are the simplest, and account for processes of acquiring knowledge and comprehension of facts and concepts. Intermediate steps on the scale (3, 4, and 5) require the processes Bloom et al have defined as application and analysis--considerably more complex operations, which involve preceding levels of knowledge and comprehension, but demonstrate as well, abilities in applying abstractions (principles, ideas, and theories) to the analysis of new situations; and, in comprehending patterns of relationship between elements within a larger pattern. Level 6 of the scale involves the most complex of the cognitive levels in the taxonomy: behaviors requiring operations of synthesis (generalization and theory construction) and evaluation.

The increasing use of the Bloom Taxonomy among curriculum workers, and its close correspondence to the analytic operations, geographically considered above, encouraged us to make use of Bloom's levels of classification in determining, finally, the statement of behavioral objectives for our Curriculum A.

Specifying Behavioral Objectives for Curriculum A

Figure 4 presents a general statement of behavioral objectives for the experimental Curriculum A of this research. It incorporates both the substantive elements (conceptual) and the behavioral elements (analytic) of geographic theory, considered above. It is organized after the classifying system of Bloom's Taxonomy (1), and incorporates a series of behaviorally stated objectives of levels of increasing cognitive complexity.

Specific behavioral objectives for lessons within the teaching sequences are presented in the Appendix in the experimental curricula included there.

Organizing the Curriculum

As earlier explained, a decision was reached to develop Curriculum A through a regional (hence integrated) rather than a topical approach to geographic analysis. Each approach permits "good geography." The regional approach held the advantage of providing the easier frame of reference for the young child--it could be applied to the analysis of the most immediate of geographic regions, his known (home) community.

Once this decision was made, the regional method offered suggestions for a second, critical decision in curriculum-making: the selection of a series of organizing centers in which geographic inquiry might be raised. Urban studies, approached through the regional method, usually proceed through inquiry into three aspects of a region: (1) identification of its forms--its residential neighborhoods, Central Business District, or industrial area, for example; (2) functional analysis of those forms, their arrangements or distribution within the urban landscape, and their paterns of relationship to other functional forms within the region; and, finally, (3) inquiry into the time sequence of the region--the study of past periods of occupance and the forces contributing to change. In these inquiries the region is studied internally; that is, analysed in terms of the component forms or subregions comprising the whole. And, the region is studied comparatively, in terms of its relationships with other regions, within some still-larger regional complex.

Curriculum A differentiated between grades 1, 2, and 3 in the regional focus developed in each. These differences are summarized as follows, and developed more fully below:

Figure 4. Behavioral Objectives for a Program of Geographic Education

OBSERVATION (Data gathering): Acquiring specific information concerning geographic features and their functions within the region. Incorporates the following levels of cognitive performance:*

1.00--Knowledge of Specific Geographic Features.

Identifies geographic features (physical and cultural) in the landscape.

Demonstrates knowledge of geographic terms.

Demonstrates knowledge of functions of specific man-made features of the landscape.

2.00--Comprehension of Geographic Terms and Concepts.

Translates geographic concepts by demonstrating their symbolic equivalents (or instances) on any of several media (maps, photos, models)

Translates verbal geographic concepts or generalizations by identifying an appropriate illustration or example correctly.

Reads each of the following:

data on the air photo
grid system on a map
legend on a map

Extrapolates accurate information or conclusions from the data of maps and air photos.

DATA ANALYSIS: Organizing information (classifying) and analysing in terms of patterns of distribution of features. Incorporates the following levels of cognitive performance:

3.00--Application.

Classifies (groups) geographic data into appropriate classes on the basis of one (simple-classification) or more (multiplicative classification) defining attributes.

*The numbering system of Figure 4 refers to cognitive behaviors similarly defined in Bloom's Taxonomy of Educational Objectives, I (1).

Applies concept of areal association to the delineation of functionally differentiated regions (on one or more defining criteria) in air photos of unfamiliar regions.

Demonstrates ability to predict the consequences of a change in a geographic factor on its related features within the regional complex. (Application of known relationships to new situations.)

4.00--Analysis

Recognizes the "character" or pattern of a region in terms of the particular association of related features which dominate in the area.

Analyses relationships (patterns of accordance) between features within a geographic region.

Analyses functional interrelationships (patterns of spatial interchange) between forms or component systems within a region, and between regions within a larger regional structure.

Recognizes causal relationships between features in a geographic region, as the consequences of change through time.

REGIONAL INTERPRETATION AND TESTING (Generalization and Inference): Structuring, verifying, and evaluating hypotheses and principles concerning the distribution of phenomena within geographic regions. Incorporates the following levels of cognitive performance:

5.00--Synthesis

Applies cartographic methods in designing a map or model of a community from data obtained in field study, or from specifications given. (Demonstrates ability to interrelate features with reference to a grid system, and to communicate pattern and structure in the environment through symbolic map language.)

Formulates appropriate hypotheses, based upon an analysis of the geographic factors involved, and modifies those hypotheses on the basis of new data or tested evidence. (Derivation of relationships.)

Structures a revised statement of a geographic generalization or abstract relationship, on the basis of concrete data. Statement must adequately account for the relationships between phenomena. (Synthesis of new statement of relationships.)

6.00--Evaluation

Applies criteria of internal consistency and accuracy of the facts to the evaluation of statements of relationships, hypotheses, or geographic generalizations.

Grade 1: Functional studies of the immediate neighborhood and its relationships with the larger urban-industrial complex. Emphasis on patterns of association between geographic phenomena interrelated in place.

Grade 2: Comparative studies of the extended urban-industrial complex, with emphasis on patterns of association between geographic phenomena functionally interrelated between places.

Grade 3: Historical studies of sequent occupance in the region, with emphasis on factors accounting for change in distributions of geographic features, over time.

The First Grade Curriculum A

Selection of Organizing Centers. The first grade curriculum was centered in a study of a series of functionally-defined component regions within the children's home community. These component regions were selected to include: children's residential (school) neighborhood; the neighborhood commercial center; a comparative neighborhood or arterial commercial center, preferably one within shopping distance of children's homes; the Central Business District; the industrial region; the administrative region; recreational regions, including mountains, harbor, and ocean-front facilities in the immediate community; and, patterns of circulation functionally linking these separate regions.

Comparative studies included in this first grade curriculum were limited to places within the community. Examples of change were largely limited to those presently under way--changes occasioned, for example, by removal of older structures in the community and by construction of new facilities. These decisions reflect recognized limits in young children's ability to structure relational concepts of times past and places distant. Within the immediate home environment, in its present and changing land-use patterns, we believed we could find sufficient opportunities to develop with young children the beginning skills of geographic analysis.

Provisions for Continuity. One important characteristic of a curriculum is its overall continuity. Each experience engaged in should open the door to the next. Each succeeding experience should extend earlier learnings, and facilitate, in turn, the continuous restructuring or refinement of the conceptual systems and skills under development. Controversies have long been waged concerning valid sources for such continuity. Some find it in the logic of the subject-matter; others, in the learner's own perceived purposes and his choice and structuring of experiences to meet ends or resolve problems important to him; others, in the inner logic of the inquiry process itself.

Continuity, in this curriculum, derives from a combination of these factors: from the logical extension of a series of functionally defined regions; and, from children's ability to use the functional concept in resolving inquiries and in anticipating, themselves, other functions that must be served within their community if their families are to enjoy satisfaction of a variety of needs.

Opening with the residential neighborhood, for example, this curriculum centers first in the population occupying the area--the children's families. Who these families are, how recently arrived, and some factors influenceing their settlement here (amenities of the region in terms of climate, housing, job opportunities, schooling, and the like) are among the inquiries raised. This local neighborhood is then analysed in terms of its features (homes, schools, and churches, e.g.), the functions they serve, and their arrangements in the landscape. Finally, changing patterns in the neighborhood are analysed, and the relations of this component region to other regions (shopping centers, e.g.) in the community are examined.

The transition from (1) an opening regional study of the residential neighborhood to (2) regional study of the neighborhood commercial center is an instance of continuity in this program. This transition occurs as children complete their study of the residential neighborhood, and turn to examining ways in which their families, living in this neighborhood, are supplied with goods and services--for first graders an easy and functional transition to the local commercial center. Transition can also occur as children develop their classroom models of the residential neighborhood, and discover some genuine geographic problems: What are the boundaries of the region? What do they do about features observed in this area (commercial structures, e.g.) which are not properly classified as residential? Are these features (a doctor's office, e.g., and a laundromat) similar to homes and apartments in their functions? If not, then are they better classified as a new, second region within this community?

Through either approach, young children move to a new, second focus in the curriculum--a study of the nearby commercial center, its specific functions, its spatial arrangements, and the processes influencing its development within this particular place. In similar sequence, children are guided to comparative studies of other commercial centers within the community: to a second nearby neighborhood commercial center, selected as one where many of their parents also shop; to an arterial commercial strip, on one of the major traffic arteries in the immediate area; and, to the Central Business District, a region to which families throughout the community travel for many of their shopping needs.

In addition to functional analyses of these regions, children are also engaged in studies of spatial interchange between these regions. Patterns of circulation, bus routes, e.g., linking residential neighborhoods and the Central Business District offer one such opportunity for study. Patterns of circulation, trucking routes, e.g., between the Central Business District and its wholesale suppliers, offer another. These studies on transportation geography serve, also, to introduce study of the industrial region of the city, located on its incoming rail line, and along the newly developing freeway system connecting this community to others in the Los Angeles Basin.

The city maintenance yards, located in the industrial center, open transition to the larger administrative functions of the city. And these facilities, in turn, open concluding studies of the city-supported system of parks, harbor, and beaches which together meet the recreational needs of the city.

Thus, over a series of transitions, children are engaged in functional analysis of a sequence of component regions and of the patterns of circulation which interrelate them. Their focus, each time, is functional: What needs of their families are met through these centers? Continuity, also, is functionally derived. Practice in regional analysis, applied in each of these studies, offers recurring opportunity to reinforce children's developing skills and understandings in geographic method.

The Second Grade Curriculum A

Selection of Organizing Centers. The second grade curriculum centered in study of the extended urban-industrial complex, with focus on comparative studies within the region, and on examination of functional relationships between places within the regional complex. These studies moved as follows: children's residential neighborhood; the neighborhood commercial center; a comparative neighborhood or arterial commercial center; the Central Business District; comparative study of the Los Angeles Central Business District; patterns of circulation (freeways, trucking routes, and railroads) functionally relating these districts, and their out-of-town suppliers; the local industrial center; extractive and cement-producing industries in mountain and desert regions of the larger regional complex; patterns of circulation functionally producers, processers, and the market; the local harbor; comparative study of the Los Angeles harbor; patterns of circulation functionally relating that harbor, the Los Angeles urban complex, and the children's home community.

As in the first grade curriculum, children each time initiated study of a regional form (residential, Central Business District, or harbor, for example) with study of the local area, in which extended field study (observation) was possible. Comparative studies (for contrastive analysis between two Central Business Districts, mining regions, or harbors, for example) included extended field trips whenever possible. (Methods and resources are described below.)

Provision for Continuity. Continuity, again, derived from children's functional analyses of community needs and activities. Since no prior instruction in the first grade program could be provided under the experimental conditions of this research, the initial organizing centers replicated the first grade program: the residential, neighborhood commercial, a comparative commercial and the Central Business Districts of their community, together with the circulation patterns which functionally interrelated these regions. Within each center, the specific features, their functions, their spatial arrangements, and the processes influencing their development were examined.

In study of their home community's Central Business District, these change-processes came under special examination. At the time of this study the core of the Central Business District was undergoing change, as a new mall was being built, new building fronts on the stores were replacing old, and the "character" of the region was changing with the introduction of several new banks, financial institutions, and high-value stores. Factors of "localization" (the attraction of the mall for new business enterprises) and of "change" thus came under considerable study. So, too, did areal differentiation in the three zones of the Central Business District: the central core with its heavy foot-traffic and higher-value jewelry and garment merchandising; the secondary area with its large banks, building and loan institutions, large department and furniture stores requiring larger floor area and locating therefore in the less expensive region immediately surrounding the core; and, the tertiary area, the fringe zone bordering on surrounding residential and industrial zones, and specializing in hotels, on the scenic park-side of the region, and in heavy industrial, plumbing and related service enterprises on the industrial limits of the region.

Brief comparisons with the Central Business District of downtown Los Angeles, where children's parents also shopped, permitted contrastive functional analysis. Again, a mall was under construction. The core of the district was marked by smaller stores and heavy foot traffic. The rapidly growing financial and business complex, the hotels, department stores, and large furniture stores defined a secondary region. The tertiary zone, as observed in air photos, was marked by rail lines and a complex of warehouse and specialized suppliers.

In each of these regional analyses, and in the freeways linking these districts, children saw major construction underway. Urban redevelopment in the local community and central Los Angeles, mall construction, street repair, and major freeway construction on the freeway connecting the local community and central Los Angeles were instances of observable construction activities. Inquiries concerning the sources of supply and specialized producers of these construction services opened studies of the community's industrial complex.

This region is located on the community's incoming rail line, and is functionally related to the larger Los Angeles basin through its rail and trucking suppliers. It is characterized by brick-making, lumbering, cement supply, and city maintenance activities, in addition to a complex of electronics and research industries. It was the former to which this curriculum gave major attention.

Comparative industrial studies included (1) brick-making in a second community in which the same company was relocating and had installed technologically advanced machinery permitting in thirty hours the same out-put their local plant produced in three months; (2) rock-product and cement mining and processing industries in the larger regional complex; and (3) the systems of interrelationships between these producing, processing, and distributing activities and their local use or consumption in the children's home community.

These investigations established one important set of economic and geographic relationships between the local community and the larger regional complex. Comparative harbor studies permitted a second. In this case the local recreational harbor was studied first, as a geographic region. The Los Angeles harbor, an industrial harbor and source of supply for local markets, was introduced as a comparative center. Study in this instance focused on regional specialization within the harbor, with special interest in the lumber yards supplying the local yards; and the fish harbor, supplying the restaurants and fish markets of the local harbor. Again, patterns of circulation (rail and freeway) linking the Los Angeles harbor, the central Los Angeles community, and children's home community were analysed as a system of functional relationships in the larger basin.

The Third Grade Curriculum A

Selection of Organizing Centers. The third grade curriculum centered in a study of sequent occupance in the greater regional complex, with emphasis on factors accounting for change in the distribution of geographic features. Three specific places were selected for comparative study at certain critical periods in the region's past: in central Los Angeles, the historic site of the city's first Spanish settlement; the children's home community, a coastal city within Los Angeles County; and Malibu, a neighboring coastal community which is still relatively undeveloped, with considerable open land still available to settlement. All three were the sites of known Indian settlements prior to the time of Spanish occupance of the region.

Provisions for Continuity. The studies moved as follows: inquiries into the natural environment and its land-use possibilities; Chumash and Gabrieleno Indian occupance of the coastal strand, with emphasis on sites in Malibu, Santa Monica Canyon and Catalina Island; comparative studies of Chumash and Gabrieleno Indian occupance of the interior oak parkland, with emphasis on sites in Malibu and the Yang-na settlement on the Los Angeles River; early Spanish occupance of the region, with emphasis on the founding of San Gabriel Mission, and the first pueblo locating historic Los Angeles; comparative studies of changing occupance during the Mexican period, including rancho development in Santa Monica and Malibu; occupance of the U.S. settlers following the Mexican-American War, focused on comparative studies of Main Street, Los Angeles and Third Street, Santa Monica in 1875; urban growth and decline with the coming of the railroads; comparative studies of Los Angeles and Santa Monica pointing up relationships between railroad franchise, harbor development, and urban "boom" and "bust;" building a region: the effects of interurban transit on the growing city (the "red-cars," freeways, and urban sprawl); the city today: comparative studies of central Los Angeles, Santa Monica, and Malibu, all in the process of change.

Learning Opportunities and Teaching Strategies

A good curriculum achieves its objectives to the degree its learning opportunities are consistent with those objectives, and with the learning capabilities of the children for whom it is designed. Objectives for experimental curriculum A were derived from the discipline of geography--from its central, organizing concept and its analytic methods. They were scaled on a continuum, from relatively simple to considerably complex cognitive operations.

And, they were operationally defined, in terms of behaviors which could be elicited in each of a series of regional studies, for each of grades 1, 2, and 3.

These regional studies or centers, just described for each of grades 1, 2, and 3, were selected as the major organizing centers of each curriculum. Each center or regional study engages children in a variety of geographic operations, consistent with the instructional objectives of Curriculum A. Each center provides for continuity by opening, in turn, questions which move the study forward into the next.

Goodlad has demonstrated a number of characteristics of the good organizing center. These characteristics include, for example: (1) provisions for a variety of learning opportunities, or "catch-hold" places, to meet the interests and capabilities of a number of individual learners; (2) opportunities for the development of a range of instructional objectives, in this case, the continuum of objectives contained within Figure 4; (3) opportunities to give practice to the behaviors sought; and, (4) opportunities for "movement"--intellectual, social, geographic, or chronological. This last condition relates to what we prefer to think of in psychological terms--provisions for continuity between centers, in terms of children's newly developing interests and inquiries, into each of a succession of geographic centers. Finally, to this list we would add one of our own: (5) opportunity within each center to reinforce prior learnings and to give systematic extension to a program of continuing learnings--the characteristic of continuity between centers within a long-term curriculum sequence.

Specifically applied to this curriculum, these characteristics suggest the following: (1) Each regional study will provide for a variety of activities or inquiries, "catch-hold" places, interesting and challenging to young children. We attempted in our developmental studies to learn from children's responses and to take our cues from interests and motivations they expressed. One observation, shared by the numbers of professional teachers, supervisors, and principals who observed these children at work, was children's deep and continuing interest and involvement in these studies. They took their interests home with them. They brought contributing material, unsolicited, which they had acquired on their own. We witnessed the expressed enthusiasms of children for their activities; and, the expressions of teacher interest in maintaining these programs and extending them into second-semester studies.

In part, these enthusiasms seemed to derive from the supportive instructional materials prepared for these activities. A major consideration directing this research was the observation that children in their opening school year are in the operational stage of learning. Concepts would require clear demonstration, preferably through direct observation of concept-examples; and, through three-dimensional materials. Children engaged in these studies would need opportunity to examine materials, to replicate patterns of spatial distribution and interaction in the "real" world, and to examine some of the consequences of change in these patterns, as they move materials, or engage in simulation of activities within and between the regions studied.

This curriculum provided such materials in the three-dimensional, scale-models we developed which replicated each of the regions under study. Scale models of structures in the regions were produced of wood, painted, and lettered, where appropriate. Assembling these regional areas, constructing additional structures where needed, and inquiring into the nature of geographic function and land-use was one focus of geographic activity in these regional centers.

Another was children's simulation of patterns of activity within and between regions. Model vehicles--transport, rail, maintenance, road-building, and water vehicles--were all provided, as appropriate to the region. Children used these vehicles in moving cargo, simulating transport patterns, or interconnecting separate places. They examined the patterns of interchange that result, and learned how such patterns can be mapped.

Children were also engaged in study and development of terrain models, representing the immediate and extended topography of their environment. They viewed films, kodachromes, prints, and line drawings, arranged in sequence, for clarifying particular concepts. And, they engaged in discussions and study, with the instructional assistance of some simply designed acetate-overlay "map systems" to clarify patterns of coordinate and correspondent relationships within regions.

This variety of materials--from manipulatable, three-dimensional objects, to pictures, to more abstract map resources--allows different "catch-hold" places for children operating at different levels of abstraction. And, it provides a balance between data-seeking activity (field study); manipulation (in the simulation activities); and, induction and higher level abstraction (supported through inquiry-based discussions).

A second characteristic of these regional studies is the following: (2) Each regional center provides opportunity for developing a range of instructional objectives. Figures 3, and 4, which provide an overview of instructional objectives for this program, demonstrate how those objectives "scale" from simpler to highly complex cognitive operations. Each regional study, developed as one in a series of organizing centers, provides opportunity for development of these operations. Each maintains, at the same time, continuing practice in all earlier operations as well. Each regional study provides opportunities for building skills in geographic data gathering--in acquiring knowledge concerning specific forms and functions within the region. Studies in the first organizing center in grades 1 and 2 (children's residential neighborhood) provide some beginning opportunities in areal analysis. These are simple relationships, tentatively explored. They are reinforced and extended later, as this residential neighborhood is related to each of the succeeding centers under study. Objectives in regional interpretation and hypothesis-testing are implemented gradually over the semester, and within the scope of young children's abilities to engage in such operations. Individual differences could, of course, be expected to account for significant variance in achievement on these operations.

A third characteristic of these organizing centers has already been suggested. (3) Each regional study will give practice to the behaviors sought. These provisions are explored more fully below, under the rubrics of acquiring data on forms and functions within regions; classifying; analysing patterns of areal distribution; analysing patterns of accordance, interrelationship, and causality; and, engaging in generalization and inference.

Observing and Acquiring Data On Forms and Functions Within Regions

Primary school programs, whether in mathematics, science, or social studies, generally share common objectives in the development of children's beginning skills in observation, classification, and contrastive analysis. All three are foundational to logical, reasoned inquiry. Beginning operations in this curriculum contribute directly to these objectives. They require children to observe, and then to differentiate between features; to group into like sets (in geographic terms, to delineate "pattern" in the landscape by identifying areas of similar land use); and to conceptualize a number of such component regions by distinguishing the forms and functions unique to each.

Field Study Trips

Acquiring data through observation is the first of the activities engaged in, in each of the regional organizing centers of this curriculum. Field study trips are the first, and necessarily most significant data-gathering operation. Because of the widespread, and sometimes abortive, use of field trips in present school curricula, several important cautions were given to the teachers of this research. First of these was that these be study trips, well-planned in advance, with instructional objectives for geographic study clearly in mind. Teachers must themselves be thoroughly familiar with the region visited. Children must have clear purposes and an organizing framework concerning what they are to see. Geographers go into the field only after careful and detailed investigation of air photos, statistical documents, and other accounts of the region. They come armed with maps, a plan of investigation, clearly stated hypotheses or questions, and contacts in the region. We've found initial, preliminary planning, making use of some of these same resources, prepared children for the study emphasis of the trip, and the specific kinds of data to be acquired.

In each curriculum, short, walking study trips into the immediate residential neighborhood are the first data-gathering operations engaged in. These are planned to teach children to see what is geographically relevant, and to distinguish forms and their functions in the urban landscape. Over the sequence of regional studies, field trips are extended into the neighborhood commercial district, the Central Business District, industrial, harbor, and contrasting regions, as defined by the specific curriculum.

For each trip and as children acquire skills in their use, maps and air photos are presented prior to departure, and observation made of the route to be taken and the features to be observed. On the trip itself, a large, undeveloped map is taped to the sidewalk or another convenient spot, children are assembled around it, oriented to the place they now stand, and given the opportunity to record critical features they observe in the immediate region. Air photos and data sheets are also available, and are used to verify changes in the area, and to record sites visited and data obtained.

Within the classroom these experiences are supplemented with kodachrome slides, and readings concerning features observed and the functions of each. These learnings are critical antecedents to children's subsequent analyses of functional differentiation within these regions. Analyzing the uses to which man patterns the land requires a depth grounding in the functions within the region and provides the basic data from which all such higher geographic analyses can be made.

Use of Scale Models

Following initial field study in each component region, children were each time engaged in classroom analysis of carefully constructed scale models of that region. Cartographers drafted these materials, to assure accuracy of scale and of representation. Each region was represented on sets of masonite boards at a scale of 1:300, painted white, and measuring 4 feet by 9 feet when assembled. To draft these boards, and achieve accurate scale in the layout of first, second, third and fourth-order streets, railroad tracks, and parking lots (the only "information" painted onto the baseboards), our cartographers consulted air photos and city maps available from the Santa Monica City Engineer's Office, and from commercial aerial photography corporations. These models were constructed to represent the specific area walked over by the children. Thus, the boards representing the immediate residential neighborhood presented the six to eight square blocks actually studied by each separate classroom group in experimental Curriculum A. Subsequent regional models were used by all classes, and so duplication could be made of the single Central Business District visited by all (produced at a smaller scale to permit reproduction of the larger surface area); the industrial region, centered on the incoming rail lines and freeway; the administrative region (an extension of the CBD in this particular community); and, one region of the Los Angeles Harbor, including the inner channels and associated oil refineries, lumber yards, and fish harbor.

In addition to the baseboards, our catographers constructed, to scale, the specific geographic structures which occupied these represented regions. The fact some changes in the landscape occurred after the models were completed was used as a "teaching opportunity." Children were asked to consider what had happened, in the landscape, to make the model in part obsolescent, and to make the necessary revisions themselves.

Finally, appropriate vehicles were provided, at like scales, for each of the models: autos, delivery trucks, and service vehicles in the residential areas; buses, trucks and autos in the commercial areas; railroad cars, road-working equipment, and city maintenance trucks and equipment in the industrial area; police cars, fire trucks, and ambulances in the administrative area; and ships, railroad cars, and oil tank trucks, lumber trucks, and other specialized transport vehicles in the harbor region.

Following field study, children were each time engaged in reproducing, accurately, the spatial layout of the region they had visited. Information on the specialized functions of each geographic feature was provided, through readings, related commercially-available films, and classroom discussions and some simulation, through dramatic play of activities within the region.

Developing Concepts Of Relative Location and Space Relationships.

All data collection and recording activities were engaged in to provide a foundation for functional analysis of these regions. Such analysis would require, first, children's ability to analyze spatial arrangements and patterns of distribution within regions. Basic to this skill is the ability to work with concepts of relative location and space relationships.

Through our pilot studies we discovered young children need support for recognizing spatial pattern within the landscape, and for seeing the spatial world in terms of a system of coordinates (the grid system). Without such instruction, children respond largely in topological terms, connecting places in terms of specific paths of movement, of immediate and only transitory importance to them. Most of the children we sampled depended either on the sensations of their own movements, or on the immediate contiguity of objects in the environment for clues to pattern or order in the landscape. Few, at this age, recognized or structured a system of space relationships (a grid) independent of their own actions or of the chance location of objects already placed within the environment.

As a consequence of these observations, the following instructional program was designed. Its purposes were to teach children (1) To map simple patterns of linear relationships between objects within regions; and (2) To extend patterns of linear relationships within a larger and stable coordinate grid system. The teaching sequence is defined below. Its effectiveness in achieving its objectives was experimentally tested, and the results reported in chapter 6 of this report.

Instructional materials for this teaching sequence included the following:

1. A three-dimensional, large-scale (1:300) regional model of the immediate residential neighborhood and its connecting neighborhood-commercial district. These models included the masonite boards on which the street patterns of the region were painted, and the scale models of residential and commercial structures in the region.

2. A small-scale, magnetic-based model of the same region, measuring, overall, 18 by 24 inches. This model consisted of a sheet of plywood permanently covered by a thin sheet of metal. The same street patterns painted on the large-scale masonite boards were replicated on this metal sheet, at considerably reduced scale. Buildings, again replicas

of those used on the large-scale model, were constructed at a proportionate scale, and strips of magnetic tape were attached to the base of each to permit their adherence to the metal sheet, once it was raised upright, at a right-angle to the floor.

3. Small model vehicles and dolls.

4. An acetate-overlay map system, 36 by 40 inches in size. Layer one introduced a pictorial symbol locating the school. Layer two located the gasoline station. Layer three located the connecting street, and marked a route between the two places by means of a series of painted red footprints. Succeeding layers similarly introduced on even-numbered layers each of a series of familiar landmarks in the region and on odd-numbered layers, the connecting route between, again by means of painted footprints. Layers were ordered so as to demonstrate by these routes (a) a series of simple linear relationships in the region, and then (b) a series of connecting axes establishing a grid system for the region as a whole. The use of acetate layers permitted children to view all preceding layers at the time any new route was superimposed, and so to observe the grid-system under development.

5. A classroom set of practice desk-maps, 18" x 24" each, prepared by a professional cartographer, and produced to scale. The maps represented the same neighborhood region under study, and made use of the same pictorial symbols introduced on the acetate overlay map system. Map #1 included the business artery on which the school and commercial buildings were located. Cross streets were indicated. Map #2 included the business artery and the network of residential streets of the neighborhood. Pictorial symbols identified key residential and all commercial structures.

For all lessons the materials were arranged as follows. The large-scale three-dimensional model was centrally located on the floor, with seating provided for children around three sides of it. The small-scale magnetic-based model was placed immediately behind the larger model, in an upright position, and oriented in the same N-S direction as the large-scale model. The acetate-overlay map system was placed also immediately behind the large-scale model, and beside the magnetic-based model. Again, the same N-S orientation was maintained. Placement of these materials allowed all children a clear and unobstructed view of each. Because all three were displayed simultaneously, and in the same N-S orientation, children could compare the same geographic region under three separate representations, employing differing scales, similar but different levels of symbolic representation, and different perspective. It was assumed that the large-scale floor model, which most realistically replicated the geographic landscape, would be most easily read. The magnetic-based model, while reducing scale and changing perspective from that of a horizontally-placed floor map to that of a vertical position, did maintain the three-dimensional, highly-concrete symbolism of the floor model. The acetate map system introduced pictorial symbols, in the same vertical orientation established by the magnetic-based model.

The experimental sequence involved establishing two sets of spatial relationships, linear and coordinate.

Establishing linear relationships.--Subjects were presented with a series of two known features along single streets of the large-scale model, and asked each time to demonstrate how a doll could be walked from one feature to the next. After a child had demonstrated the route correctly, he was asked to demonstrate that same route on the magnetic-based small scale model. The appropriate layers of the acetate-overlay map system were then brought down, one at a time, to illustrate the same features and the footprints recording the linear route between the two.

A series of such routes was practiced, introduced each time through the use of objects on the two models, and verified against the routes depicted on subsequent layers of the acetate map system. An active response was each time elicited by the request the child demonstrate the route on each of two scale models, and then verify his route against the data of the map system. Follow-up practice exercises allowed children individually to record a series of linear routes on the desk maps prepared for these sessions. Responses were immediately checked, reinforced positively if correct, and changed if incorrect.

Establishing coordinate relationships.--Subjects were presented with a series of individual features in the landscape, each one at right angles to a known feature on an already-established linear route on the map-system. Each time subjects were instructed to extend the route from the known feature to the newly identified one. As in the lessons just completed, subjects demonstrated the routes first on the large-scale model, then on the small-scale model, and then verified the routes against the appropriate layers of the acetate-overlay map system.

In these lessons, a series of new features and their routes was introduced. They were sequenced to establish two sub-coordinate systems, and then to integrate all routes into a single complex coordinate system, accounting for all features in the region.

A final lesson series utilized the small model vehicles, and was designed to "purge" the coordinate system of the specific objects earlier used to establish its reference points. Axes (the streets) of the grid system were labeled, and specific geographic features removed. Subjects were then asked to place each of eight model cars at the intersections of named streets, and each of four geographic features at new locations, identified by the intersects of the grid system. Responses were immediately reinforced.

Through this instructional program, children in our experimental groups were found to make significant gains in recognizing systems of spatial coordinates, and in using these systems in identifying positions of relative location within regions.

Organizing and Classifying Geographic Data

Learning to classify geographic features requires that children develop differentiating criteria for grouping features into like sets (in geographic terms, to delineate "pattern" in the landscape by identifying areas of similar land use). Following these beginning classification tasks, children can then be engaged in regional analysis, considering why these features "pattern" as they do, and how man's activities in the landscape can be explained, and their relationships analysed.

Within this curriculum, beginning classification skills are developed through practice exercises in (1) identifying separate forms or structures within these regions (residential, commercial, or industrial for example), and then (2) grouping such features into sets defined by function (finding, or designing, a neighborhood which is mostly single-family residential, for example).

Children are first engaged in grouping exercises using the three-dimensional models. Using information concerning the functions of the models, children are asked to group all models that are alike in use. Grouping is introduced first in the neighborhood residential region, and the associated neighborhood commercial district. Children learn to differentiate between "residential" and "commercial" functions. They learn to sub-classify by "single-family" and "many-families" residential. "Circulation" functions are introduced to account for transportation features.

In the study of the Central Business District, the second-grade curriculum provides further sub-classification activities through functional grouping of "inner core," "secondary," and "boundary" (properly "tertiary") commercial features. Over the succeeding regional centers of the curriculum, children learn to classify industrial, recreational, and administrative functions.

Classification of landforms and vegetation associations are developed in the grade three curriculum. Children in this curriculum classify both on single and multiplicative criteria, through proper placement of Indian sites, for example: Coastal Chumash; or, inland Gabrieleno.

Air Photo Classification Skills. Classification, introduced through use of models, was also practiced at increasingly symbolic levels by use of photos, pictorial maps, and air photos. The air photo is so important a tool in geographic research, we believed it a worthy adjunct to this curriculum, provided we could design learning experiences for children which would negotiate their mastery of critical skills in air photo reading and analysis. In developing and field-testing this curriculum, we developed special exercises in applying already-acquired grouping or categorizing skills to the analysis of air photos of known and unknown regions. On the basis of evidence that such skills are learnable in the primary grades, we have included a sequence of those exercises within this curriculum, and prepared the instructional materials which go with them.

Children engaged in these exercises learn the cues of the air photo which signal class-membership in the concept-categories of urban geographic analysis (residential or commercial, e.g.). And, they learn to group features of the air-photo (all single-family residences, for example) by encircling like features with colored markers so as to define areas of differentiated land-use (residential or commercial neighborhoods, for example).

Appendix A demonstrates the cues to which subjects were taught to respond. A sequence of study exercises was designed which utilized selected air photos of familiar areas. Following practice in identifying features within familiar regions, children were helped to verbalize the distinguishing attributes of each, and the cues for identifying those urban types on the air photo. Practice to generalize the skill to recognizing these features on unfamiliar but similar regions followed.

A second phase of the instructional program was designed to teach children to respond to geographic patterns as a whole. A series of exercises was designed which centered first on grouping sets of familiar objects, and provided for subsequent practice in grouping sets of defined geographic features. Appendix B demonstrates the order of tasks introduced.

Several particularly troublesome problems in air photo analysis are taken into account in this lesson sequence. Item series 3-5 and 9-12 are designed to train children to treat as irrelevant the visual barriers which streets and natural landscape features seem to present, when the task required is to encircle all of a particular zone (residential, for example). Item series 6-8 and 15-16 are designed to teach children to group in terms of extended sets, enclosing all proximate members of the set, despite the configuration of the regional pattern which results. Item series 13-20 are designed to teach children to respond in terms of majority members of a set. In the geographic landscape it is not unusual for a neighborhood to include some features not properly classified among the elements which establish the "character" of the region. These lessons did not attempt to teach decision-making for characterizing a region, but rather to teach children to respond appropriately once instructions for delineating an area were given.

Effects of this program on children's learning of air photo classification skills are reported in Chapter 5 of this report.

Analysing Patterns of Accordance Within Regions

Following steps in classification of geographic features, children are engaged in analysis of patterns of accordance and interrelationship in the distribution of features within regions. One of our major purposes in undertaking this research was to determine whether young children could engage in relational thinking of this order.

Geographers approach these analyses through separately mapping distributions of two or more features, and then analysing the patterns of correspondence which appear as they compare those distributions in the landscape. Such patterns may be simple, locational associations such as those represented by the correspondence of large supermarkets and their adjacent parking areas. Patterns may, however, be considerably more complex, involving influences of a number of interacting factors--distributions, for example, of such factors as land resources, labor, technology, and market accessibility and their relationships to distributions of particular industrial sites.

A first grade curriculum would, of course, demonstrate considerable limitations in the complexity of the covariant analyses introduced. Opportunities for such analyses are, therefore, introduced gradually in the opening weeks of this curriculum, with simple locational associations the first to be examined. Over the semester's time, three-way analyses are introduced, and some opportunities provided to explore possible effects of altering one or another of several associated features--the beginnings of causal analysis.

Within this curriculum opportunities for analysis of patterns of correspondence in the landscape include, at simpler levels, the examination of relationships between (1) arterial commerce development and major through-streets within the community; (2) neighborhood commercial centers, dominated by large supermarkets, and their nearby customers located in the residential neighborhoods; or (3) distributions of residential neighborhoods in the regions of canyons and mountain slopes of Malibu, and such factors as terrain (homes follow the ridges) or accessibility (home construction follows initial road building).

More complex associations are examined as several features are observed to interact. The relationship of the railroad to industrial development in the community is first examined as children observe that the location of industries is linear, and follows the route of railroad penetration of the city. Specific locations within the industrial area demonstrate additional patterns of correspondence, however. For example, the location of a brick-making plant and a china manufacturer is found to be associated with two site factors: the distribution of accessible natural resources in the area, and zoning laws which determine the extent of accessible land for manufacturing enterprises. Similarly, in studies of the local harbor and the larger bay on which the community is located, patterns of association between an artificial breakwater, the changing shoreline, and sedimentary fill are considered.

Instruction in these associations begins each time with attention to the careful placement of individual features of the landscape on large-scale three-dimensional models of the region. Children learn through these activities that location is important, and that relative position has geographic meaning. Inquiry is raised concerning particular associations of features within these regions; and acetate overlay instructional programs are introduced to serve, at a largely pictorial level, the functions performed by geographers' cartographic analyses. Each layer of the acetate series superimposes, upon a simple map base, symbols representing distribution of a single geographic feature. Studying patterns of correspondence between features, observable when two or more such layers are superimposed, provides the data from which analyses can be drawn.

Tests of children's recognition of such patterns of correspondence within regions come as children are asked to anticipate effects or modifications in the landscape where a process of change is already underway. In a residential neighborhood, for example, where older single-family residences are being razed to make way for more lucrative, large apartments, children demonstrate their recognition of the relationship between new zoning laws in the neighborhood and changing land-use by anticipating future use for certain presently vacant lots: they will probably be used for apartment construction. Or, in an industrial region, where adobe resources are nearly depleted, and community zoning laws deny further land acquisition on the part of a brick manufacturer, children can anticipate some modification of present activities in this place.

Analysing Patterns of Interaction Between Regions

Acetate overlay systems, similar to those used in demonstrating patterns of correspondence in regions, also serve in clarifying for children patterns of spatial interchange and relationship between functionally differentiated regions. These patterns of interchange are first paced out by moving model vehicles within and between places, represented in the three-dimensional regional models designed for this program. Those same routes are then demonstrated on each of a series of layers of an acetate overlay program, superimposed onto a simple map base of the region or regions studied. Observing the relationships between two or more such routes provides, again, source data for children's analysis of systems of interchange and functional relationships within the larger region.

In the first and second grade curriculum, three teaching sequences are included to develop skills in functional analysis of patterns of spatial interaction between regions. The first supports children's understanding of functional relationships between regions within the local community, and is developed and then extended as each new regional study is introduced.

Following study of the residential neighborhood and its associated commercial district (presented on the same model layout, and differentiated by buildings and the streets which associate with the residential and the busier commercial artery), children are introduced to the extended Central Business District of their community. Through simulation and dramatic play, children use the vehicles, and carry out the activities which functionally relate these regions. Teachers are encouraged to extend the streets between the boards by running masking tape over the floor, so that children may "drive" the vehicles as they would normally go. An acetate overlay system schematizes the spatial relationships established by children's movements on the floor. Layer one pictorially represents the area presented by the neighborhood residential and commercial region. Layer two introduces the Central

Business District. Layer three represents the circulation patterns functionally linking the two.

Similarly, when the industrial region is introduced as the next regional center, the industrial regional model with its trucks, trains, sand, gravel, lumber, brick, and service equipment (including telephone equipment and service trucks) is added. Children's simulation activities are now extended to include: transporting commercial supplies from incoming railroad cars and truckers to stores in the Central Business District; moving roadworking equipment to centers in the Central Business District where a new mall is being constructed, or to the freeway construction site; and, moving bricks and lumber from those M-3 zoned sites to places in the residential and "urban-renewal" areas in their community where building construction is underway. Again, layer four of the acetate system introduces the industrial region, and layer five presents the circulation patterns functionally relating this region to all earlier introduced regions.

Follow-up mapping exercises provide children practice in extending similar routes between functionally differentiated regions, in response to story-situations read orally by the teacher.

In the second grade curriculum, only, similar acetate overlay system maps are used to demonstrate patterns of relationship between (1) rivers and rock mining locations, (2) deserts and cement plants, (3) mixer plants, and (4) the system of freeways and railroads connecting the separate sites. This acetate map set is introduced in study of the extended Los Angeles Basin and its resources for meeting construction needs in the home community. An acetate system is also used to relate (1) the product-resources of Los Angeles Harbor (fish and lumber are illustrated), (2) markets in Los Angeles and Santa Monica, and (3) the system of freeways and rail transportation interrelating the three.

In the third grade curriculum, a similar acetate overlay system is used to relate (1) land forms, (2) water resources, (3) vegetation associations, (3) occupance and (4) movement patterns of three separate Indian populations of the extended Los Angeles region.

Analysing Causal Relationships

Verifying causal relationships requires data concerning patterns of change over time. The limitations of the first grade curriculum to studies of present patterns within the region severely restricts the opportunities for causal analysis. Patterns of correspondence within a region are not sufficient evidence for attributing causality to one or another of the factors surveyed. The time dimension is a critical one, in providing evidences of antecedents to patterns presently etched upon the land.

Within Curriculum A, causal analyses are planned for grades two and three. The decision reflects recognition of the need for developing, first, a core of geographic concepts and methods as a basis for subsequent extensions into comparative studies of historic occupance of a region.

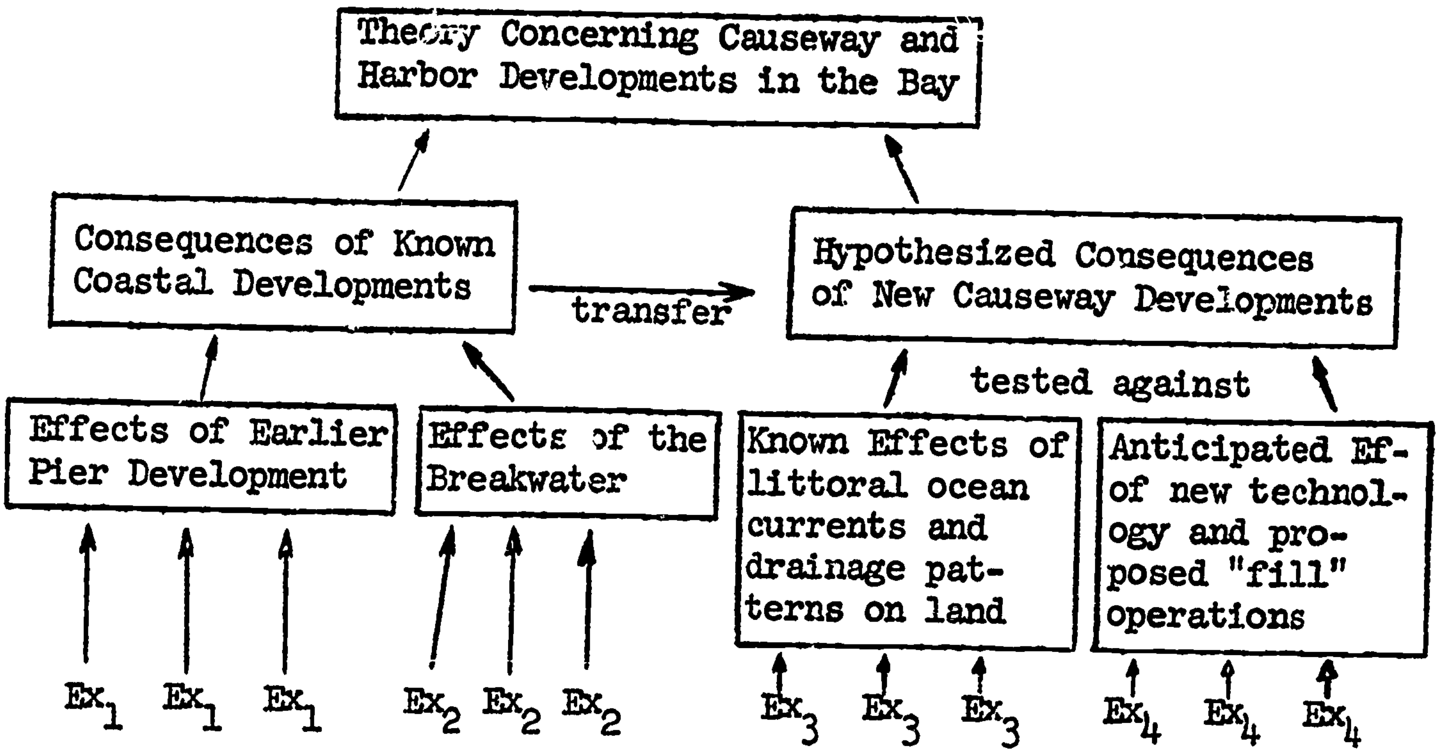
In grade two, causal analysis is introduced late in the semester, with consideration of policy problems being faced by the community concerning development of the bay and the local harbor on which Santa Monica is located. Inquiry is developed concerning what effects might follow construction of a proposed causeway (for freeway purposes) out over the bay. Children are taken on a field trip to the present harbor, and gather data on present natural features of the bay region. They examine, from vantage points on the bluffs and on the pier, as well, effects of present man-made structures in the water (a breakwater, and a series of piers, each several miles distant from the next). They consult air photos from the City Engineer's Office, which show the shoreline, and the same piers, breakwater, and coastal features they can observe from the outer pier. They are assisted to recognize important differences in the coastal formation where the breakwater is located.

In the classroom they are presented data from three successive periods in the region's history, with photographic evidence of the effects, overtime, of man-made intrusions into the water. They read about the effects of littoral drift, and problems in keeping the small harbor dredged and navigable, due to effects of the breakwater on water movement. They examine arguments proposed for a coastal throughway, maps government agencies had produced, and they weigh, overall, possible consequences of some proposed new actions.

Figure 5 illustrates development of the inquiry, as it occurred, in the experimental classrooms over several days' time.

Consequences known to follow from certain earlier developments formed the basis for predicting some consequences of proposed new action. These hypotheses were checked against data presently available concerning oceanographic effects and engineering know-how of today. No final test, of course, was possible. Action has not yet been taken. But the tentativeness of the theory structure was considered as much its value as the processes by which data were verified and a theory derived. Holding knowledge tentatively as new data come in is an important aspect of analytic inquiry approaches.

Figure 5. The Structuring of a Theory of Harbor Development



Third grade opportunities for developing causal analyses are focussed in the comparative studies of Malibu, Los Angeles, and Santa Monica under successive periods of human occupance. They include:

(1) Influences of antecedent land use patterns on subsequent land use. (Examples: effects of the Spanish metes and bounds system of marking land-grants on present street-patterns in central Los Angeles contrasted with the effects of later Anglo occupance on later urban street development.)

(2) Influences of periods of boom and decline in the development of Santa Monica and Los Angeles harbor and railroad complexes on population change.

(3) Further influences of the coming of the railroads, and--subsequently--the interurban "red cars" on population growth in Los Angeles and Santa Monica.

Each analysis is supported by a system of interrelated instructional materials. These include:

(1) Three-dimensional models of Main Street, Los Angeles, and Third Street, Santa Monica at three periods in time: 1875, 1910, 1960.

(2) Historical photos of these two regions, depicting functional activities on these two streets, and in Santa Monica and Los Angeles harbors, at approximately these same dates.

(3) Air photos of these regions at several succeessive periods in time.

(4) Historic documents, including maps, newspaper accounts, and army engineer's drawings relevant to occupance patterns and problems in the region's past.

(5) Related reading materials for students.

CHAPTER IV

THE CRITERION INSTRUMENT MEASURING ACHIEVEMENT IN GEOGRAPHY

Since no test was available for assessing children's achievement in geography, on criterion behaviors relevant to the research purposes of this project, it was necessary to develop a criterion instrument during Phase I of this project. The dependent variable of this research was established as children's achievement in geography, at each of three levels of cognitive operations. Achievement was differentiated, after Blooms' Taxonomy of Educational Objectives[1], to include the following three levels of cognitive performance in geography: (1) knowledge of geographic features and functions and interpretation of their symbolic representation on maps; (2) comprehension of the central concept of geographic theory; and (3) the ability to apply the concept of areal association in regional analyses of unfamiliar environmental complexes.

The Achievement Test in Geography, developed for this research, is, accordingly, differentiated at each grade level into three sub-tests, measuring three criterion behaviors: I. Knowledge of Geographic Features and Functions; II. Comprehension of the Concept of Areal Association; and, III. Ability to Apply the Concept of Areal Association in Regional Analyses.

In addition, items within all sub-tests are distributed over three levels of symbolic difficulty, and include (1) pictorial items, (2) symbolic items, at two levels of symbolic abstraction, and (3) air photo items.

Test Development Procedures

Antecedent to the construction of test items, a statement of test specifications was prepared, to direct item development and selection. Specifications concerned test objectives (including both substantive and behavioral elements), item types, procedures for item selection and refinement, and overall distribution of items within the final criterion scales.

Test Objectives

The sub-tests for each of grades 1, 2, and 3 were designed to assess children's learning of the concept of areal association, at three levels of cognitive achievement, and at each of three degrees of symbolic abstraction.

Levels of symbolic abstraction were differentiated as (1) highly pictorial; (2) symbolic, at two levels of abstraction; and (3) air photo, requiring conceptual organizing responses to differentiate relevant data from a photo-context of relatively low perceptual support.

A statement of test objectives for each of the three cognitive levels is given below. Sample items are drawn from first, second, and third grade tests.

I. Demonstrates Knowledge of Geographic Features and Functions

A. Demonstrates knowledge of geographic features by correctly marking the correct picture.

Sample Item:

"Look at row 1. It shows a SUPERMARKET, a RESIDENCE, a CHURCH, a HOSPITAL. Draw a line on the picture that shows a place where people live--(pause)--where people live."

B. Demonstrates knowledge of geographic functions by correctly marking the correct picture.

Sample Item:

"Look at row 3. It shows an APARTMENT, a RAILROAD SIDING, a SUPERMARKET, a FACTORY. Draw a line on the commercial place--(pause)--the commercial place."

C. Demonstrates knowledge of geographic terms by correctly identifying on a physical map examples of geographic features.

Sample Item:

"Question 2 asks you to find a delta. Look at your map. Is place 1 a delta? Is place 2 a delta? Is place 4 a delta? Is place 7 a delta? Choose the one best answer. Circle that number on line 2."

II. Demonstrates Comprehension of the Concept of Areal Association

A. Demonstrates comprehension of patterns of accordance within regions by correctly marking the two pictures which functionally associate.

Sample Item:

"Look at row 3. This row shows a MAINTENANCE YARD, a DRUG STORE, an APARTMENT HOUSE, a FACTORY.

Two of these pictures show places that belong in the same neighborhood. Draw a line on the two pictures that belong in the same neighborhood."

B. Demonstrates comprehension of patterns of accordance between features within regions by correctly identifying from a map, the one feature which is "out of place."

Sample Item:

"Look at Page E. Find Map 1. (Check to see that child is on place.) Something is wrong in Map 1. Something is out of place. Find what is in the wrong place. Draw a line on the thing that is out of place."

C. Demonstrates comprehension of patterns of accordance within regions by correctly identifying probable location of features on a contour map giving data of latitude, wind directions, and elevations.

Sample Item:

"Find the place on your map where you would probably find the heaviest rainfall. Is it place 1, place 3, place 5, or place 8? Circle the correct answer on line 5 of your answer sheet."

D. Demonstrates comprehension of patterns of spatial interaction between regions by correctly identifying a functional circulation pattern.

Sample Item: (Regional map item at symbolic level 2. Residential, commercial, and industrial regions represented, with four routes marked in colors.)

"Here is story 1. Listen to the story. Then be ready to color a line next to number 1 on your answer sheet.

Mrs. Smith lives in the residential neighborhood. She wants to buy groceries for dinner. Which trip will Mrs. Smith take?

"If you think she takes the red trip, color line 1 red.

If you think she takes the blue trip, color line 1 blue.

If you think she takes the orange trip, color line 1 orange.

If you think she takes the purple trip, color line 1 purple."

III. Demonstrates Ability to Apply Concept of Areal Association in the Analysis of Unfamiliar Regions

A. Applies concept of areal association in the delineation of functionally differentiated regions in air photos of unfamiliar regions.

Sample Item: (Using air photo symbolization)

2. "Here is an air photo of a place in a large city. Use your red marker. Draw a line around the place that is mostly stores. Draw your line so that all of the commercial region is inside your red line."

B. Applies concept of areal association in predicting land-use in unfamiliar, hypothetical regions.

Sample Item: (Map item of an hypothetical region, with locations marked.)

6. "The Greenwood Lumber Company plans to build a new lumber yard to handle its lumber shipments in this region. It wants to find a place where it can move lumber in from its forests in the north, and then truck the lumber to its customers when they buy it. Choose the best place for the lumber yard. Circle the answer on line 6."

C. Predicts patterns of spatial interchange between functionally differentiated regions.

Sample Item: (Map item of an hypothetical region.)

9. "Supermarkets in D City are having a sale on fresh fish. Choose the route that best shows how the fish reach the supermarkets in D City. Circle the answer on your answer sheet."

D. Demonstrates ability to predict the consequences of change in a geographic factor on its related features in a regional complex.

Sample Item: (Using map symbols.)

1. "This is a map of a neighborhood that is going to change. A new freeway will soon be built through this neighborhood. The brown lines mark the freeway. The brown arrows mark the ramps where cars will get on and off the freeway.

"After the freeway is finished, one street will be much busier than it is now. Find that street. Is it red street? Is it green street? Is it blue street? Is it orange street? Mark the street that will be busier on line 1."

E. Applies concept of causality to the interpretation of geographical events over time.

Sample Item:

5. "At first wagons brought people to the new little town by the ocean. People came in wagons, camped in the canyon, and later built their houses. Later railroads brought people. The city grew fast when the railroads came. When the railroads ran no more, many people left, and the city lost its businesses, and saw hard times. The street cars changed all that. The street cars connected this town with Center City, and brought many people here to live. Business grew once again, and the little town was saved.

"The most important idea of this story is:

__________ a. The street cars saved the little city by the ocean.

__________ b. The city changed over the years.

__________ c. Transportation changed over the years.

__________ d. Transportation helped the city grow.

Item Development and Selection

Following development of the test objectives, items were developed for tryout with children enrolled in our pilot-study classrooms. Multiple-choice items were selected as the item-type for all sub-tests, with the exception of sub-test IIIA, measuring children's ability to apply the concept of areal association in the delineation of functionally differentiated regions in air photos of unfamiliar regions. For these items, subjects were given marking crayons, and asked to draw a line onto the air photo, to enclose a requested functionally-defined region. Responses were then scored with reference to a six-point scale, representing a continuum ranging from a minimum to a criterion-level response. The rating scale is presented in Figure 6, in Chapter 5 of this report. Multiple-choice items were scored on a right-wrong criterion, and equally weighted in all sub-tests of the criterion instrument.

On the basis of item analysis following initial tryouts, weak and poorly-discriminating items were revised or deleted. Table VII presents distribution data for test items included in the final criterion instruments, for each of grades one, two, and three, and over the three sub-tests for each grade level. Knowledge items totaled 36, 36, and 32 in grades one, two and three, respectively. Comprehension items totaled 24 in each of the three grades. Application items totaled 24 in grade one, 42 in grade two, and 16 in grade three. Total test items in the grade one instrument were 84; in the grade two instrument, 102; and, in grade three, 72.

The criterion instrument is reproduced in the Appendix of this report.

Test Reliability

Estimates of test reliability for each of the sub-tests, at each of grades one, two, and three, are presented in Table VIII. Estimates were obtained by the split-half method. Correlations obtained between performance on odd and even numbered items were corrected by the Spearman-Brown formula to obtain an estimate of the reliability of the sub-test as a whole. Data used in estimating test reliability were obtained from test performance of instructed subjects, engaged in the experimental Phase II of this research.

In general, the test has adequate reliability. Reliability coefficients ranged from a low of .529 for Application (air photo interpretation) on the grade one test to .953 for Comprehension on the grade two test. Reliability coefficients for the first grade sub-tests were consistently lower than were those for the second and third grade tests.

TABLE VII

DISTRIBUTION OF TEST ITEMS, BY SUB-TEST AND GRADE

Sub-test:	Grade: 1	2	3
I. <u>Knowledge</u>			
A. Features	17	17	16
B. Functions	19	19	16
Total	36	36	32
II. <u>Comprehension</u>			
A. Patterns of Accor'lance within Regions	15	15	21
B. Spatial Interaction between Regions	9	9	3
Total	24	24	24
III. <u>Application</u>			
A. Delineation of Areas in Air Photo Analysis	7	7	
B. Prediction of land-use (Patterns of accordance)	6	19	
C. Spatial Interaction	22	6	4
D. Change Analysis	99	10	7
E. Causality			5
Total	24	42	16
Grand Total	84	[illegible]	72

TABLE VIII

TEST RELIABILITY: ODD-EVEN RELIABILITY COEFFICIENTS* BY SUB-TEST AND GRADE

	Grade		
	1 (N = 57)	2 (N = 45)	3 (N = 57)
Test I Knowledge	.626	.932	.820
Test II Comprehension	.626	.953	.720
Test III Application			
Pictorial	.595	.733	
Air Photo	.529	.866	
Symbolic			.813

All correlations corrected by the Spearman-Brown formula.

*All correlations $P < .01$.

CHAPTER V

RESULTS: CHILDREN'S LEARNING OF THE SKILLS OF AIR PHOTO ANALYSIS

In developing the experimental Curriculum A in geography, we needed to obtain evidence whether young children could learn a critical analytic skill in geographic inquiry, the skill of (1) reading air photos as a source of data on the geographic landscape, and (2) drawing appropriate interpretations from the data these photos provide. This chapter reports the results of an experimental research, carried out within the developmental phase of the larger research project.

Its purpose was to test the effects of a newly designed program of instruction in air photo analysis. The decision whether or not to include air photo analysis in the experimental curriculum A was contingent upon the outcomes of this study.

The technique of air photo analysis has not ordinarily been introduced in the elementary school. For the professional geographer, however, it serves as a key research tool. Areal differentiation--the patterning of the landscape--is more clearly observable from the air than it is from the field. While direct field observation is a necessary aspect of geographic research, the availability of air photos provides a useful and welcome resource in the geographer's initial reconnaissance, systematic mapping, and analysis of regions.

For our purpose, air photo analysis offered a particularly effective method for obtaining data on two key questions in our research: (1) Could young children learn to operate effectively with an instructional medium of relatively low perceptual support, and successfully obtain information from the patterns of form, shadow, and texture presented in the air photo? (2) Could they then appropriately apply a central concept of geographic theory in determining patterns of functional differentiation within the geographic region as a whole?

The test was a severe one for the central thesis of the larger research: the thesis that young children can learn the concept of areal association, and can learn to apply it appropriately in analysing and interpreting geographic regions. The present study reports the first of these findings.

Related Research

Thinking operations required in tasks of air photo analysis are essentially those of relational thinking in a context of relatively low perceptual support. Visual data of the air photo are communicated in patterns of tone, shadow, and texture, restricted to a continuum of varying shades of gray, and presented at a greatly reduced scale. Identifying the features of a complex cultural landscape from these visual stimuli, and inferring from them patterns of land-use within the region as a whole require powers of selective discrimination and of relational thinking concerning patterns of correspondence between features observed. Research is not available concerning young children's ability to engage in either of these operations, specifically applied to the tasks of geographic inquiry.

That children in the middle elementary school years can engage in relational thinking is supported by those researches of Piaget which have found the logic of classes and of relations developed in the concrete operations of middle childhood. The age citations given for the onset of these operations have been subject, however, to frequent dispute, as Piaget himself anticipated(27). Inter-individual variability, or factors in the experimental task have variously been accorded a contributing role in the earlier incidence of these operations (2, 21). The evidence of one research that an instructional program may account for significantly earlier development of causal thinking in science suggests the validity of the major problem of this study(15).

Evidence concerning young children's learning under instructional conditions of relatively high or low perceptual support is, again, limited. A number of basic researches, extending Piaget's earlier studies, have affirmed a developmental order in children's acquisition of abstract, symbolically mediated concepts. Concept formation has been observed to proceed from children's early perceptually bound, precategorial responses through later stages of reduced perceptual support and increased symbolic mediation(27). Whether classroom programs can negotiate young children's application of a relational concept to the analysis of geographic regions, presented under conditions of severely reduced perceptual support, is a question, again, in need of study. Both problems are of central importance to this research.

Background

Exploratory study preceding this research had indicated that children, instructed in certain skills of geographic analysis, could learn to use geographic categories as "organizers" in classifying data within the urban geographic landscape. First and second grade children did, for example, learn to classify neighborhoods of single and multiple dwellings as "residential"; to differentiate between neighborhood commercial, arterial commercial, and Central Business Distrists; and, to identify industrial, recreational, and administrative areas within the region under study. Instruction had utilized field study and carefully scaled classroom models, constructed to replicate geographic features of the same landscape observed in the field.

When introduced to large scale air photos (scale 1:2400) of these same regions, children were able to locate and identify certain critical features of the landscape, already identified "in the field" and on "model layouts" of the region. Their responses to the air photo were highly specific, however, and targeted only individual structures in the landscape, perceived either from some unique surface configuration (a large "T" on the local supermarket, e.g.) or for their spatial contiguity with an already-identified geographic feature. Such responses demonstrated no generalization to classes of functionally similar but unknown features (other supermarkets, e.g.) within the environment. In addition, no responses were made which indicated that subjects perceived geographic pattern (i.e., patterns of functional relationships) within the region as a whole--a critical skill in geographic analysis of the region.

Purpose

The purpose of this study was to test whether children, instructed in skills of differentiating and grouping geographic features into functionally defined sets, would perform significantly higher than would controls on tasks of air photo analysis requiring: (1) use of certain generalized cues in identifying functionally-similar geographic features (all commercial structures, e.g.), wherever they occurred on the air photo; and, (2) grouping such features into zones of similar land use or function (a "neighborhood commercial zone," e.g.). Both skills were held to be prerequisite to any subsequent success with the geographic task of interpreting patterns of land use within regions.

Definition of Criterion Behaviors

Preliminary analysis suggested three separate component tasks to be involved in criterion performance in air photo analysis.

They included:

(1) Ability to identify geographic features of the landscape in terms of the class-concept or category to which the geographer assigns them.

Since this study developed within the context of children's study of an urban community, it was features of the urban landscape with which we were concerned; e.g., single and multiple family residences; commercial structures, including those of the local neighborhood, arterial, and Central Business districts; streets (first, second, third, and fourth order); parking lots, and freeways.

(2) Ability to identify "pattern" in the geographic landscape in terms of functionally differentiated zones (residential, commercial, etc.) within the urban complex.

Involved here are tasks of (a) abstracting the criteria for grouping features of the landscape into one or another of these zones; (b) identifying those same criteria (the defining attributes) from the restricted visual data of the air photo; and, (c) engaging in appropriate grouping or classifying behavior, namely: encircling "like" elements and ignoring, as irrelevant, perceptual cues of separation and contiguity provided by non-critical features of the landscape. (Streets, e.g., may provide particularly troublesome cues to the beginning student, in their visual suggestion of "natural boundaries," where in fact none may exist on the grouping criteria applied here.)

(3) Ability to draw inferences regarding the character of the region, both in terms of (a) patterns of functional differentiation within the area, and of (b) inferred process relationships between features within the region as a whole.

Hypotheses

Concerning effects of the instructional programs, the following hypotheses were formulated:

(1) Experimental subjects, instructed in skills of differentiating and grouping geographic features into functionally defined sets, would evidence significantly higher achievement in delineating pattern in air photos of unfamiliar regions than would control subjects.

(2) No significant difference would obtain between groups on a criterion test measuring ability to idenfity specific features of the landscape, and to differentiate between the function of each.

Method

Subjects

Subjects were sixteen second grade children, regularly enrolled in a self-contained classroom of a public elementary school in an urban, racially integrated neighborhood (Negro-, Mexican-, Anglo-, and Japanese Americans). Parent occupations, if used as a sole index, would place these families chiefly in the lower middle class. Children's IQ, obtained through group administration of the SRA Primary Mental Abilities, grades 2-4, ranged from 58 to 127, with a class mean of 100.437.

The research design employed in this study called for random assignment of subjects into experimental and control groups. Some unavoidable transfers from the school in the weeks immediately preceding the experiment reduced the sample. Newly enrolling students were not included in the study, in order to maintain a six weeks' antecedent instructional program in geography as a constant for all subjects, experimental and control. Experimental and control groups were stabilized with eight subjects each, randomly assigned to either group.

Research Design

The research design employed in this study was a simple randomized design, with two treatment groups, and analysis of covariance applied to adjust for chance differences in IQ and pretest controls[18]. Antecedent to this study, all subjects were group-tested for IQ, and individually tested for achievement on the criterion instrument measuring skills in air photo analysis.

The research design provided for an initial six weeks of antecedent instruction in geography, administered to all subjects.

Immediately following, subjects were randomly assigned to experimental and control groups for three weeks' geographic instruction under programs differentiated as follows. Experimental subjects at this time received instruction in (1) differentiating geographic features on air photos, and (2) grouping those geographic elements into functionally defined sets. Control subjects received continuing practice in differentiating specific geographic features on familiar air photos and model layouts, and examining the nature of their functions within the community. Individually administered post-tests in air photo analysis of an unfamiliar geographic region were administered to all subjects, experimental and control, two weeks after the conclusion of instruction.

Program of Antecedent Instruction

The six weeks' program of antecedent instruction in geography, administered to all subjects, centered in study of the local community, selected on the advice of geographers as the best possible laboratory for beginning geographic analysis. Practice was given in identifying geographic features, analyzing their functions, and determining their patterns of distribution in the landscape. Because this study centered in an urban community, it was pattern within the urban landscape which was examined; for example, distribution of single and multiple family residential neighborhoods; commercial centers, including local neighborhood, arterial, and Central Business Districts; circulation patterns; and, transport systems within the region under study.

Lessons engaged children in field study and in classroom analysis of carefully constructed scale models of regions within their community. Cartographers had been engaged in drafting these materials, to assure accuracy of scale and of representation. Each region was produced at a scale of 1:300 on sets of masonite boards, painted white, and measuring 4 feet by 9 feet when assembled. Street patterns of each region were drafted on the boards, and painted black. Cross-walks and lines marking lanes for traffic were added, to differentiate first, second, third, and fourth order streets. No additional information was provided on these boards. Scale models of structures in the given region were produced of wood, painted, and lettered, where appropriate. Assembling these boards, and inquiring into the nature of geographic function and land use within these neighborhoods, was a major focus of geographic instruction.

Experimental Program in Set Discrimination and Functional Grouping

On conclusion of the period of antecedent instruction, experimental subjects were enrolled in a three weeks' program of air photo instruction, meeting for thirty minutes three days each week. This program involved: (1) teaching the generalized cues which serve to differentiate geographic features on air photos; and, (2) teaching skills in grouping these features into zones of similar land use or function within the region.

Appendix A demonstrates the cues to which subjects were taught to respond. A sequence of study exercises was designed which utilized selected air photos of familiar areas. Following practice in identifying features within familiar regions, children were helped to verbalize the distinguishing attributes of each, and the cues for identififying those urban features on air photos. Practice exercises requiring identification of urban features on unfamiliar but similar air photos followed.

A second phase of the instructional program was designed to teach children to respond to geographic patterns as a whole. A series of exercises was designed which centered first on grouping sets of familiar objects, and provided for subsequent practice in grouping sets of geographic features. Appendix B demonstrates the order of tasks introduced.

Several particularly troublesome problems in air photo analysis are taken into account in this lesson sequence. Item series 3-5 and 9-12 are designed to train children to treat as irrelevant the visual barriers which streets and natural landscape features seem to present, when the task required is to encircle all of a particular zone (residential, for example). Item series 6-8 and 15-16 are designed to teach children to group in terms of extended sets, enclosing all proximate members of the set, despite the configuration of the regional pattern which results. Item series 13-20 are designed to teach children to respond in terms of majority members of a set. In the geographic landscape it is not unusual for a neighborhood to include some features not properly classified among the elements which establish the "character" of the region. These lessons did not attempt to teach decision-making for characterizing a region, but rather to teach children to respond appropriately once instructions for delineating an area were given.

Measurement

Pre and post tests involved the use of a criterion instrument designed with the assistance of a professional geographer. An air photo of a region unfamiliar to the children, but similar to those studied, was mounted on a sheet of bristol board, 30 by 40 inches, and covered with a sheet of clear, prefinished acetate.

Subjects, tested individually, were seated before a low table on which the air photo had been placed, and were given four acetate marking crayons to use in completing the orally given test instructions. A test session lasted approximately twenty-five minutes, was administered by a trained research assistant, and was tape recorded.

Air Photo Analysis, Scale I. The first of the scales administered measured subjects' ability to identify geographic features on the air photo and to identify simple functional relationships between those features in terms of movements between places. Subjects were asked to locate single and multiple family residences, commercial structures, and major arteries; and, to project simple routes as demonstration of their understanding of patterns of circulation between places within that region.

Air Photo Analysis, Scale II. The second of the scales provided a measure of subjects' ability to delineate pattern in the geographic region. Over a series of items children were asked to identify certain functionally differentiated regions (single-family residential, multiple family residential, and commercial) and then to draw a line so as to enclose the region on the air photo.

A seven-point scale differentiated responses along a continuum ranging from a minimum grouping response--enclosure of some structures within the requested area--to maximum enclosure of the requested area, with all boundaries of that area coterminous with the boundaries of unlike surrounding regions.

Mean performance at level 5 of the scale was considered acceptable for beginning geographic analysis and air photo interpretation, and served therefore, by definition, as criterion performance for this study. A team of two trained observers analysed subjects' responses and reached agreement in the scoring of each.

Set Discrimination and Grouping Test. In addition to these data, information was obtained concerning children's mastery of the basic grouping tasks in which the experimental group had been trained. A series of 20 picture items, similar to those of the practice sessions, was prepared and administered to all subjects at the outset and conclusion of the three weeks' instructional program. Responses were scored on a right-wrong criterion.

Figure 6. Scoring Criteria for Air Photo Analysis, Scale II

1 - Encloses two or more structures of the requested set within a single block.

2 - Encloses two or more structures of the requested set within two blocks.

3 - Encloses a majority of the requested structures within an area of from three to five continuous blocks. In areas of mixed land-use, the enclosed region includes no more than a minority of non-members of the set (less than half of the total structures enclosed).

4 - Encloses a majority of the requested structures within an area of from six to ten continuous blocks. In areas of mixed land-use, enclosed region includes no more than a minority of non-members of the set (less than half of total structures enclosed).

5 - Encloses a majority of requested structures within the total region in a single set. Region enclosed includes no more than a minority of non-members of the set.

6 - Same response as 5. Boundaries are coterminous with boundaries of one or more unlike sets.

7 - Same as reponse 5. All boundaries coterminous with boundaries of other unlike sets, with result the entire region is functionally delineated and enclosed.

Results

Analysis of covariance, with IQ and pretest scores introduced as controls, provided the statistical method for testing the significance of differences between experimental and control subjects' responses.

Effects of Instruction in Set Discrimination

As a measure of the effectiveness of the experimental program in eliciting appropriate grouping responses, an F value was obtained to test the significance of the between-groups difference in set discrimination. Table X presents unadjusted and and adjusted means of experimental and control subjects. The difference between adjusted means was significant beyond the .01 level (Table IX).

TABLE IX

SUMMARY OF ANALYSES OF COVARIANCE OF SUBJECTS' SET DISCRIMINATION AND AIR PHOTO INTERPRETATION UNDER EXPERIMENTAL AND CONTROL PROGRAMS

SOURCE	df	MS	F
Set Discrimination:			
Between	1	52.774	16.094*
Within	11	3.279	
Total	12		
Air Photo Interpretation I:			
Between	1	2.077	
Within	12	1.427	1.455
Total	13		
Air Photo Interpretation II:			
Between	1	82.787	11.716*
Within	12	7.066	
Total	13		

* $P < .01$

TABLE X

SUBJECTS' CRITERION AND CONTROL VARIABLE MEANS FOR BETWEEN-GROUPS ANALYSIS OF ACHIEVEMENT IN SET DISCRIMINATION

Group	N	Criterion: Post-Achievement Unadjusted	Criterion: Post-Achievement Adjusted	Control: Pretest Achievement	Control: IQ
Experimental	8	16.250	15.632	11.000	103.875
Control	7	11.714	12.419	12.142	102.571

Effects of Instruction on Air Photo Interpretation, Level I

It was hypothesized that no significant difference would obtain between groups on Scale I of the air photo test, measuring ability to identify features within the geographic environment. Such responses, it was anticipated, would transfer appropriately from field study and from the instruction in geography experienced by both groups. Table XI presents unadjusted and adjusted means of experimental and control subjects. The F-value, presented in Table IX, is not significant.

TABLE XI

SUBJECTS' CRITERION AND CONTROL VARIABLE MEANS FOR BETWEEN-GROUPS ANALYSIS OF ACHIEVEMENT IN AIR PHOTO INTERPRETATION, LEVEL I

Group	N	Criterion: Post-Achievement Unadjusted	Criterion: Post-Achievement Adjusted	Control: Pretest Achievement	Control: IQ
Experimental	8	10.375	9.386	10.750	103.875
Control	8	8.875	9.864	9.500	97.000

Effects of Instruction on Air Photo Interpretation, Level II

It was hypothesized a significant difference would obtain between groups in measures of children's ability to delineate pattern in the geographic landscape in terms of functionally differentiated areas. Control subjects obtained a mean total (unadjusted) score of 5.625 over the total items of the test, a minimum grouping performance. Control subjects, uninstructed specifically in grouping tasks, produced the particularistic response, and over the several items of the scale, enclosed on the average two or more structures within no more than two blocks of the total available area.

Experimental subjects obtained a mean total (unadjusted) score of 13.75 over the several items of the scale. Their grouping responses, on the average, appropriately enclosed a majority of requested structures over more than six to ten continuous blocks. Experimental subjects' mean group performance closely approached, but did not reach, the level of achievement established as prerequisite to next steps in a projected sequence of learnings in geographic interpretation of air photos. As predicted, the F value for the between-groups difference was significant ($P < .01$).

TABLE XII

SUBJECTS' CRITERION AND CONTROL VARIABLE MEANS FOR BETWEEN-GROUPS ANALYSIS OF ACHIEVEMENT IN AIR PHOTO INTERPRETATION, LEVEL II

		Criterion		Control	
		Post-Achievement		Pretest	
Groups	N	Unadjusted	Adjusted	Achievement	IQ
Experimental	8	13.750	11.737	8.250	103.875
Control	8	5.625	7.638	5.125	97.000

Discussion

Results of the experiment were in accordance with the prediction that subjects instructed in set discrimination and grouping would demonstrate significantly higher achievement on a criterion instrument requiring delineation of areas of functional differentiation on an air photo of an unfamiliar urban region than would control subjects. No significant difference obtained between experimental and control subjects on tasks requiring identification of features in the air photo. Subjects instructed in the grouping task, however, achieved significantly higher mean performance than did control subjects in delineating areas of functional differentiation within the unfamiliar air photo.

While mean performance of the experimental group over the several items of Scale II did not reach criterion level 5 of the scale, it closely approached this performance level (4.58), and suggests the usefulness of continued study in this field. The experimental instructional period was of relatively short duration, and allowed no practice on air photos, once the critical grouping response had been established. It seems reasonable to predict, in view of these results, that added practice in aerial differentiation on air photos would yield continued increments in learning.

Children's performance, on the whole, demonstrated they could obtain information from the patterns of form, shadow, and texture the air photo presents. The urban region depicted on the criterion air photo was an unfamiliar one to the subjects. Correct responses required, therefore, generalization of prior-learned class-cues to the task of decoding the complex surface landscape represented in the restricted data of this photo.

Beyond recognizing these features, experimental subjects evidenced significant gains in delineating patterns of areal distribution within the landscape. To perform successfully in this task, it was necessary for subjects (1) to respond to features of the landscape in terms of their class membership as defined by geographers, and (2) to group all like features within the air photo into logically extended sets of maximum similarity.

This second task is complicated by the fact perceptual groupings of the air photo are not at all times coincidental with the logically extended <u>conceptual</u> groupings the geographer employs. It was interesting to us to learn that our subjects' early difficulties in overriding the visual distractors of the air photo and achieving the more elegant and logically inclusive groupings were problems advanced students majoring in geographic field study and cartographic analysis at the university level were also experiencing. The more primitive response in the case of both groups is to respond perceptually to the cues of spatial proximity. Learning to ignore these cues as irrelevant and to group in terms of logically extended classes is the central conceptual task in air photo analysis. Subjects instructed in the experimental program designed for this research performed with significantly higher achievement with respect to these behaviors than did control subjects.

Summary

Results of this study provided encouraging evidence young children could acquire some beginning skills in using a key analytic tool in geographic research. This study developed within the context of our larger research in teaching geography, and was designed to test the hypothesis that second grade subjects, instructed in an experimental program in reading air photos, would evidence significantly higher achievement in delineating functionally differentiated pattern in the geographic landscape than would control subjects.

A task analysis was made of the criterion behaviors involved in reading and analysing air photos and an experimental program designed to measure achievement in set discrimination, identification of geographic features, and delineation of pattern in air photos of unfamiliar regions. Findings supported the hypothesis that instructed experimental subjects would achieve significantly higher scores in criterion tasks requiring delineation of patterns of functional differentiation in air photo analysis.

On the basis of these data, air photo analysis was incorporated as one instructional objective in the experimental Curriculum A of the larger research program.

CHAPTER VI

RESULTS: CHILDREN'S USE OF COORDINATE REFERENCE SYSTEMS IN MAPPING

The study reported here was conducted within the developmental Phase I of the larger research program. It was designed to obtain evidence of young children's ability to profit from instruction in spatial relationships. This problem was an important one in the larger context of our research program. The conceptual content of experimental Curriculum A required children to think in relational terms concerning the distribution of features in the landscape. To determine patterns of areal relationship (patterns of correspondence) between features within regions requires that the learner (1) first recognize how those features distribute within the larger spatial system, and (2) then determine patterns of correspondence in the distribution of two or more such features.

It seemed clear to us that young children would not be able to succeed in either of these geographic tasks unless they could first learn to respond to the region as a spatial system. The question whether children in grade one (approximately six years of age) could learn to recognize a system of stable coordinate relationships within regions was one for which no experimental evidence was available. It was the purpose of this study to obtain evidence whether young children in grade one could learn to use a coordinate reference system as a framework for ordering the data of a geographic region.

The central question of this study was the following: Can young children, in grade one, learn to use coordinate reference systems in mapping, and to recognize stable spatial relationships within regions, as a consequence of a program of instruction designed to support these learnings?

Related Research

Except for some important studies of Piaget (22), the question whether young children can learn to order data within a system of coordinate relationships in space has not been researched or even raised. Despite the central importance of geographic education in the elementary school social studies, research concerning children's geographic and spatial learnings is virtually non-existent, and despite numerous hortatory articles proposing certain grossly defined "developmental" stages in mapping, a review of related research demonstrates virtually nothing is known concerning the young child's progress through such a series of proposed "stages," nor are the effects of instructional variables on such progress known.

As early as 1934 Mitchell had proposed a natural progression in children's mental development and in their maturing ability to "discover relationships" in the geographic environment (20). More recently, Saboroff (24) has proposed a logical sequence in the development of children's mapping skills, and Kohn (17) has suggested a teaching sequence premised upon children's developing ability to learn through increasingly symbolic experiences. Experimental studies to test these, and other, proposals for instruction are singularly lacking. The McAulay research (19), purporting to test children's ability to read maps, is criticized by geographers on the grounds the instruments used are not maps, providing a planometric view of an area, but are figures, or sketches, displaying gorss inaccuracies in scale and spatial relationships.

The Piagetian studies of children's concepts of space (22), while largely focused on their mastery of topological, projective, and Euclidean space in tasks of mathematical, scientific, and pictorial analysis, do suggest some important implications for geographic instruction. The development of a coordinate system of relationships, a characteristic of Euclidean space, is, to Piaget, the culmination of a series of developmental "stages" in children's learning. Euclidean, like projective space, derives from topological space, and presupposes the topological concepts of order and dimensionality in the placement of objects. In the "toplogical" stages of development (Stages I and II, in the Piagetian analysis) the young child responds perceptually to objects, but does so without reference to a point of view or spatial frame of reference (22: 244). Simple "connected" notions are characteristic of his percepts of space. It is only gradually that children learn to establish the conceptual relationships that impose a larger reference system of horizontal and vertical axes (the grid system), constituting a permanent frame of reference irrespective of the potential displacement of objects within it.

The concept of Euclidean space is, of course, critical to geographic analysis. It is, according to the Piagetian thesis, developed gradually, emerging in "Stage IIIA" (ages 7.8-9 years), and accomplished when the child's use of partial reference systems, accounting for some relationships, only, is replaced by his ability to construct coordinate axes embracing the entire spatial field (Stage IIIB, ages 9-10 years).

In these studies, as in previous analyses, Piaget has made use of clinical diagnosis; no attempt has been made to study the effects of instructional variables introduced as possible modifiers of the spatial concepts under study. While individual differences are apparent in the data of the reported case studies, the nature of such differences was not examined. In short, the problems of instructional significance are unstudied. It is to those problems that this research was addressed.

Purpose

The purpose of this study was twofold: (1) to develop a teaching sequence to instruct children in certain linear and coordinate relationships on maps representing familiar neighborhood regions; and (2) to test whether children, instructed in this program, would perform significantly higher than controls on a criterion instrument measuring subjects' topological and Euclidean concepts of space.

Particularly interesting to us were Piaget's analyses of the predominantly perceptual nature of children's topological concepts of space, and the conceptual development required if the child is not merely to assemble those perceptual data, but to coordinate those data within a single, comprehensive system of relationships. Our instructional purpose, therefore, was to develop a teaching sequence which would utilize the young child's perceptual predispositions in responding to the geographic landscape, and then support his learning of a system of abstract linear and coordinate relationships he might impose in ordering all such perceptual data. Our research purpose was to test whether such an instructional sequence would elicit significant increments in children's learning of concepts of Euclidean space.

Hypotheses

Concerning effects of the instructional program, the following hypotheses were formulated:

1. Subjects, instructed in skills of mapping linear and coordinate relationships, would evidence significantly higher overall achievement on a test of spatial concepts in mapping than would subjects experienced only in the use of three-dimensional objects within simulated geographic regions.

2. Subjects instructed in skills of mapping coordinate relationships would evidence significantly higher expression of Euclidean concepts of space than would subjects experienced only in the use of three-dimensional objects within simulated geographic regions.

A corollary interest in this research was to determine whether subjects' achievement in the learning of Euclidean concepts of space would correlate significantly with conceptual intelligence. It could be anticipated, following Piaget's analysis, that the obtained r between achievement and intelligence would be significant, but that the correlation between achievement and perceptual intelligence, as measured by the SRA Primary Mental Abilities, K-1, would not be statistically significant. The third hypothesis of this research, therefore, predicted:

3. If instruction in spatial relationships made a significant contribution to subjects' learning of Euclidean concepts of space, then this achievement would be found to be significantly correlated with conceptual, but not with perceptual, intelligence.

Method

Subjects

Subjects were fifty first grade children, regularly enrolled in two self-contained, graded classrooms in an urban elementary school. Parent occupations, if used as a sole index, would place these families in the middle-middle and upper-middle class. Children's IQ, obtained through group administration of the SRA Primary Mental Abilities, K-1, ranged from 78 to 145, with a mean of 112.3 for the experimental group, and 109.5 for the controls. The between-groups difference in intelligence, as determined by a t-test, was not significant.

Research Design

The research design employed in this study was a simple randomized design, with two treatment groups, and t-tests used to test the significance of between-groups differences in intelligence, and in pretest and post-test achievement. To test the significance of between-groups differences in topological, transitional and Euclidean concepts of space, the median test for independent groups was used.

The research design provided for an initial two weeks of antecedent instruction in geography, administered to all subjects. Immediately following, subjects were randomly assigned to the experimental and control programs for two weeks' instruction, 20 minutes per day, under programs differentiated as follows. Experimental subjects at this time received instruction in (1) locating routes of linear movement on large-scale and small-scale three-dimensional model layouts, replicating familiar neighborhood regions and identifying those same routes on an acetate-overlay map system especially designed for this program; (2) practicing skills in mapping linear relationships on specially prepared desk maps of the same region; (3) locating routes establishing a set of stable coordinate relationships on the large-scale and small-scale three-dimensional model layouts of the same region, and identifying those routes on the acetate-overlay map system; and (4) practicing skills in mapping coordinate relationships on specially prepared desk maps of the region. Control subjects received continuing practice in differentiating specific geographic features, and moving objects on the same three-dimensional model layouts representing the same geographic regions as those utilized in the experimental program. Post-tests measuring children's spatial concepts in an unfamiliar geographic region were administered to all subjects, experimental and control, two weeks after the conclusion of instruction.

Programs of Antecedent Instruction

A two weeks' program of antecedent instruction in geography, administered to all subjects, centered in field study of the local community, selected on the advice of geographers as the best possible laboratory for beginning geographic analysis. Practice was given in identifying geographic features in the immediate residential and neighborhood commercial regions, analyzing their functions, and determining how they located in the landscape.

Children were engaged in field study, together with classroom analysis of carefully constructed scale models of these residential and commercial neighborhoods. Cartographers had been engaged in drafting these materials, to assure accuracy of scale and of representation. Each region was produced at a scale of 1:300 on sets of masonite boards, painted white, and measuring 4 feet by 9 feet when assembled. Street patterns of each region were drafted on the boards, and painted black. Cross-walks and lines marking lanes for traffic were added, to differentiate second, third, and fourth order streets in the neighborhood. No additional information was provided on these boards. Scale models of str_ctures in the given region were produced of wood, painted, and lettered, where appropriate. Assembling these boards, and inquiring into the nature of geographic function and land use within these neighborhoods, was a major focus of geographic instruction.

Experimental Program in
Spatial Relationships

On conclusion of the period of antecedent instruction, experimental subjects were enrolled in a two weeks' program of instruction in spatial relationships. This program involved: (1) learning to map simple patterns of linear relationship between objects within regions; and (2) learning to extend patterns of linear relationship within a larger and stable coordinate (grid) system. Instructional materials included the following:

1. A three-dimensional, large-scale (1:300) regional model of the immediate residential neighborhood and its connecting neighborhood-commercial district. These models included the masonite boards on which the street patterns of the region were painted, and the scale models of residential and commercial structures in the region.

2. A small-scale, magnetic-based model of the same region, measuring, overall, 18 by 24 inches. This model consisted of a sheet of plywood permanently covered by a thin sheet of metal. The same street patterns painted on the large-scale masonite boards were replicated on this metal sheet, at considerably reduced scale. Buildings, again replicas of those used on the large-scale model, were constructed at a proportionate scale, and strips of magnetic tape were attached to the base of each to permit their adherence to the metal sheet, once it was raised upright, at a right-angle to the floor.

3. Small model vehicles and dolls.

4. An acetate-overlay map system, 36 by 40 inches in size. Layer one introduced a pictorial symbol locating the school. Layer two located the gasoline station. Layer three located the connecting street, and marked a route between

the two places by means of a series of painted red footprints. Succeeding layers similarly introduced on even-numbered layers each of a series of familiar landmarks in the region and on odd-numbered layers, the connecting route between, again by means of painted footprints. Layers were ordered so as to demonstrate by these routes (a) a series of simple linear relationships in the region, and then (b) a series of connecting axes establishing a grid system for the region as a whole. The use of acetate layers permitted children to view all preceding layers at the time any new route was superimposed, and so to observe the grid-system under development.

5. A classroom set of practice desk-maps, 18" x 24" each, prepared by a peofessional cartographer, and produced to scale. The maps represented the same neighborhood region under study, and made use of the same pictorial symbols introduced on the acetate overlay may system. Map #1 included the business artery on which the school and commercial buildings were located. Cross streets were indicated. Map #2 included the business artery and the network of residential streets of the neighborhood. Pictorial symbols identified key residential and all commercial structures.

For all lessons the materials were arranged as follows. The large-scale three-dimensional model was centrally located on the floor, with seating provided for children around three sides of it. The small-scale magnetic-based model was placed immediately behind the larger model, in an upright position, and oriented in the same N-S direction as the large-scale model. The acetate-overlay map system was placed also immediately behind the large-scale model, and beside the magnetic-based model. Again, the same N-S orientation was maintained. Placement of these materials allowed all children a clear and unobstructed view of each. Because all three were displayed simultaneously, and in the same N-S orientation, children could compare the same geographic region under three separate representations, employing differing scales, similar but different levels of symbolic representation, and different perspective. It was assumed that the larger-scale floor model, which most realistically replicated the grographic landscape, would be most easily read. The magnetic-based model, while reducing scale and changing perspective from that of a horizontally-placed floor map to that of a vertical position, did maintain the three-dimensional, highly-concrete symbolism of the floor model. The acetate map system introduced pictorial symbols, in the same vertical orientation established by the magnetic-based model.

The experimental sequence involved establishing two sets of spatial relationships, linear and coordinate.

Establishing linear relationships.--Subjects were presented with a series of two known features along single streets of the large-scale model, and asked each time to demonstrate how a doll could be walked from one feature to the next. After a child had demonstrated the route correctly, he was asked to demonstrate that same route on the magnetic-based small scale model. The appropriate layers of the acetate-overlay map system were then brought down, one at a time, to illustrate the same features and the footprints recording the linear route between the two.

A series of such routes was practiced, introduced each time through the use of objects on the two models, and verified against the routes depicted on subsequent layers of the acetate map system. An active response was each time elicited by the request the child demonstrate the route on each of two scale models, and then verify his route against the data of the map system. Follow-up practice exercises allowed children individually to record a series of linear routes on the desk maps prepared for these sessions. Responses were immediately checked, reinforced positively if correct, and changed if incorrect.

Establishing coordinate relationships.--Subjects were presented with a series of individual features in the landscape, each one at right angles to a known feature on an already-established linear route on the map-system. Each time subjects were instructed to extend the route from the known feature to the newly identified one. As in the lessons just completed, subjects demonstrated the routes first on the large scale model, then on the small-scale model, and then verified the routes against the appropriate layers of the acetate-overlay map system.

In these lessons, a series of new features and their routes was introduced. They were sequenced to establish two sub-coordinate systems, and then to integrate all routes into a single complex coordinate system, accounting for all features in the region.

Follow-up practice exercises with the desk maps required children individually to record a series of routes which established a grid system on the map. After each route was established and reinforced, children were encouraged to seek alternate routes as other ways of reaching the same destination. Responses were each time immediately verified.

A final lesson series utilized the small model vehicles, and was designed to "purge" the coordinate system of the specific objects earlier used to establish its reference points. Axes (the streets) of the grid system were labeled, and specific geographic features removed. Subjects were then asked to place each of eight model cars at the intersections of named streets, and each of four geographic features at new locations, identified by the intersects of the grid system. Responses were immediately reinforced.

Measurement

Pre- and post-tests involved the use of a constructive-response instrument, designed to elicit children's structuring of a set of geographic data. Subjects were tested individually on the pretest, and in small groups on the post-test. The test consisted of a single sheet, 11 x 17 inches, and folded to reveal the upper half of the map, only. Features in the hypothetical landscape were depicted through highly pictorial symbols and included, in the upper half of the map, a school, two houses, a drug store, and a lake. The lower half of the map, folded back until used in the second half of the test, introduced the additional features of a gasoline station and a church. Features were so placed and scaled as to be accounted for within a single grid system, but no cues were given to the system.

Subjects were instructed that this sheet represented a neighborhood somewhat similar to their own. Individual features were identified. Subjects were requested to add the streets they thought were needed. Then, over a series of ten questions, subjects were asked to mark and number each of a series of specific routes. For each route subjects were invited to project streets as needed.

An eight-point rating scale was constructed, which differentiated responses along a continuum, ranging from a topological response--accounting for concepts of spatial order and continuity, only--to the establishment of a general system of coordinate axes accounting for positional relationships over the entire space. The final response category (level 8) is that corresponding to Piaget's operational definition of Euclidean space.

FIGURE 7: RATING SCALE: SPATIAL CONCEPTS IN MAPPING

Level I: Topological (assumes notions of order and dimensionality):

1 - Independent routes (concepts of order, continuity).

Demonstrates topological ideas of order and continuity by linking two objects, with a line. Does so by "aiming along a direction of travel," with destination-object the single reference point.

Routes typically curvilinear or linear, bearing no relationship to any other route or system of routes.

Routes frequently swing around other objects, but may cut through a building or cross another line. In these cases, no effort is made to parallel the route or establish a common reference system with regard to it.

2 - "Influenced" routes (concept of proximity, a perceptual response).

Demonstrates topological ideas of order and continuity by linking two objects along a "line of travel." Evidences influence of a pre-established line by following it or "drawing near" for a portion of the new route only.

Fails to demonstrate "parallelism" in that pre-established route does not serve as a stable reference system. New route may join the old briefly, and then depart. The "distance joined" is, in each case, less than what might have been used if a system of parallel structure had been developed.

Level II: Transitional (development of sub-reference systems demonstrating mastery of straight-line parallels. Systems remain purely "internal" to a number of closely related objects).

FIGURE 7: (Continued)

3 - Parallel routes, linear relationship only.

Inter-connects two objects, using a pre-established route when the new route is uni-directional and requires linear extension of it only. Maintains parallelism between the old and new routes.

4 - Parallel routes, single-axis system only.

Interconnects two objects, using pre-established route as a partial reference system. Parallels earlier route as one axis of a two-directional route. Demonstrates use of an outside reference system in joining the two routes, but the system of reference is incomplete, accounting for one axis of the journey, only. Governed by perceptual response.

5 - Parallel routes, within two-directional system (demonstrates recognition of right angles).

Interconnects two objects, using two or more pre-established routes within a partial reference system. Parallels each of two or more earlier routes as references within a single system. Streets may be established as connecting links in the system, but serve only to stabilize the specific routes taken. Streets may be later extended, but such extensions are added only as a specific route requires. (It is objects, not positions as such, which the streets connect.)

Level III. Euclidean (system of interrelationships between positions. A gradual mastery of extended reference systems, and of construction of coordinate axes embracing entire spatial field).

6 - Interconnecting routes within a two-directional grid.

Extends streets as a system of relationships within space. Streets introduced after a route is suggested, but are laid out with reference to a larger system of positions and not to the objects alone.

FIGURE 7: (Continued)

Extends streets beyond the objects to be connected.

Links streets with reference to other streets already on the map.

7 - Positional relationships established through sub-system of coordinate axes (limited area).

Establishes sub-system of coordinate axes as a pattern of fixed relationships within area. Streets laid out with reference to one another, allowing for movement between objects, but representing as well a fixed set of positional relationships along coordinate axes in space. In doing so, child accounts for only a part of the total space. Critical feature of level 7, distinguishing it from level 6, is child's structuring of these relationships irrespective of a particular route to be taken. Goes beyond a route to structure positional relationships within area.

8 - Positional relationships established through system of coordinate axes, accounting for total space.

Establishes system of coordinate axes as a pattern of fixed relationships within total area. Streets laid out with reference to one another, allowing for movements between objects, but representing, as well, a fixed set of positional relationships along coordinate axes in space. In doing so, child accounts for total space.

Cooresponds, in Piaget's studies, to child's immediate, verbalized intention to construct such a system. A general coordination of all lines and parallels throughout entire field of objects.

Mean performance at level 6 of the scale was considered to be an acceptable demonstration of young children's beginning mastery of a system of Euclidean space relationships. It served, therefore, by definition, as criterion performance for this study.

A team of two trained observers analyzed subjects' responses, and reached agreement in the scoring of each.

Results

Effects of Instruction in Spatial Relationships

The first hypothesis of this research had predicted a statistically significant between-groups difference in favor of subjects instructed in tasks of mapping linear and coordinate relationships. For purposes of t-test analysis, subjects' total achievement scores on the criterion instrument were used. Experimental subjects, as predicted, demonstrated significantly higher post-test mean achievement than did controls ($p < .01$).

Table XIII presents experimental and control subjects' mean IQ and pretest achievement, determined through pretest administration of the criterion instrument. In neither instance was the between-groups difference statistically significant. Subjects' mean total pretest scores was 13.5 for the experimental group and 15.3 for the controls. Over the twelve items of the instrument, subjects, on the average, demonstrated pre-instructional performance between levels 1 and 2 of the rating scale. Their responses, as might have been predicted, were largely topological, demonstrating the ability to link features in terms of a "line of travel" in which concepts of order and continuity were apparent, but in which the specific features of a single route served as its sole frame of reference. These early responses represented what might be described as "spaghetti mapping." Routes criss-crossed at random, and not infrequently cut through other buildings, without reference to those structures as relevant to the present route undertaken.

Post-test achievement demonstrated gains for both experimental and control subjects. Apparently work with the models served to influence control subjects' concepts of space, and to account for mean post-test achievement in this group at level 2.68 of the scale, a mean score indicating mastery of Level I topological concepts. Children, following instruction in the

TABLE XIII

BETWEEN GROUPS ANALYSIS: INTELLIGENCE AND PRETEST ACHIEVEMENT IN SPATIAL CONCEPTS IN MAPPING

	Group I		Group II			
	N	Mean	N	Mean	diff	t*
Intelligence	23	112.3	27	109.5	2.8	0.716
Pretest	23	13.5	27	15.3	1.8	0.611

*With between 23 and 27 degrees of freedom, a t greater than 2.052 would be required for significance at the .05 level.

TABLE XIV

BETWEEN-GROUPS ANALYSIS: POST ACHIEVEMF SPATIAL CONCEPTS IN MAPPING

	Group I			Group II				
	N	Mean	S.D.	N	Mean	S.D.	diff	t
Post Achievement	23	48.7	18.06	27	32.1	12.56	16.6	3.63*

*$p < .01$

control program, were also demonstrating, in some instances, beginning concepts of parallelism in their mapping. In establishing new routes, they were responding to the influence of proximate routes and, in some instances, making reference to pre-established routes when the new route could be projected by a linear extension of an already-existing line of travel.

Experimental subjects demonstrated a mean post-test achievement level at 4.0 of the scale across all twelve items of the criterion instrument. This score represented a response level within Transitional Level II of the scale, and demonstrated mastery of parallel routes and the use of an outside reference system in joining two routes. The reference system was, however, incomplete, and accounted for one axis of the journey, only. Where streets had been established, they served to stabilize specific routes, and were not properly interpreted as evidence of children's acquisition of a system of abstract spatial relationships. Experimental subjects, like controls, failed to reach criterion performance (level 6 of the scale).

Subjects' Learning of Concepts of Euclidean Space

Subjects under the experimental program did evidence the higher post-test achievement in spatial learnings, as predicted. Subjects' mean performance did not, however, achieve level 6 of the scale, denoting mastery of Euclidean concepts of space.

The second hypothesis had predicted that experimental subjects would evidence a significantly higher expression of Euclidean concepts of space than would controls. To test this hypothesis, the mean percentages of subjects' responses at each of the Topological, Transitional, and Euclidean levels of the scale were calculated. The median test was then employed to test the significance of the between-groups difference at each of these levels.

As demonstrated in Table XV, the between-groups difference was statistically significant for both the Topological and Euclidean levels of the scale. Experimental subjects demonstrated a mean 25.72 percent of topological responses, a percentage score significantly less than the 50.92 percent evidenced by the controls (p about .05).

No significant between-groups difference obtained in the case of Transitional responses. Close to half of the responses made by both groups were at this level. These are interesting statistics, and compared with the pretest results demonstrate that both programs did support children's spatial learnings.

The most statistically important difference obtains at the Euclidean level of the scale. Less than 3 percent of control subjects' reponses were classifiable at these levels. Experimental subjects obtained a mean 23.19 percent reponse at this level, a statistic accounting for close to one fourth of subjects' responses. The between-groups difference is significant ($p < .01$) and establishes confidence that the effects of the experimental instructional program were considerable in supporting children's beginning learnings of concepts of Euclidean space. What effects might have obtained had instruction been continued over a longer period of time, or a different type of criterion instrument employed, cannot, of course, be determined from these data.

Correlations between Intelligence and Mapping Skills

The third hypothesis had predicted that if the instructional program did contribute to subjects' learning of Euclidean concepts of space, then subjects' achievement would be significantly correlated with conceptual, and not perceptual intelligence. Euclidean concepts require the use of perceptual data (an enabling function), but go beyond the percepts gained to an active integration or ordering of those data within a system of conceptually-defined, abstract space relationships.

To test hypothesis 3, achievement scores of the experimental subjects, alone, were used. Intelligence was measured by the Primary Mental Abilities, K-1, which permitted differentiation by verbal, spatial, and perceptual intelligence.

Data are presented in Table XVI. As hypothesized, the correlation between perceptual intelligence and achievement in these higher mapping skills requiring concepts of Euclidean space was not significant ($r = .093$). Interestingly, the correlation between spatial intelligence and mapping achievement also failed to reach statistical significance ($r = .353$, p less than .10). A significant correlation was obtained between verbal intelligence and children's achievement of Euclidean concepts in mapping ($r = .574$, p less than .01) It is possible to interpret these data by suggesting that the enabling perceptual skills, prerequisite to the mapping tasks tested on our criterion instrument, were sufficiently mastered by all subjects to contribute no differentiating effects with respect to subjects' mapping achievement. Conceptual intelligence, on the other hand, correlated positively with subjects' emergent skills in the conceptual tasks of mapping Euclidean relationships. These skills required

TABLE XV

SUMMARY OF MEDIAN TEST RESULTS OF SUBJECTS' TOPOLOGICAL, TRANSITIONAL, AND EUCLIDEAN CONCEPTS OF SPACE UNDER PROGRAMS I AND II

Group	N	M	Proportion Exceeding Median Value	χ^2
<u>Topological</u>				
Group I	23	25.72	.478	3.631*
Group II	27	50.92	.740	
<u>Transitional</u>				
Group I	23	51.09	.695	0.572
Group II	27	46.91	.592	
<u>Euclidean</u>				
Group I	23	23.19	.565	7.785**
Group II	27	2.78	.185	

*p about .05

**p less than .01

"overriding" of the simple cues of perceptual proximity and order, and the structuring, instead, of a larger system of abstract spatial relationships, conceptually defined under conditions of minimum environmental cues. With this behavior conceptual intelligence correlated significantly.

Discussion

Results of the experiment were in accordance with the prediction that subjects instructed in tasks of mapping linear and coordinate relationships would demonstrate significantly higher overall mean achievement on a test of spatial concepts in mapping than would control subjects. While both experimental and control subjects benefited from their respective programs, significantly higher increments were obtained under the experimental program.

Control subjects, who engaged in practice in assembling large-scale, three-dimensional models of the geographic neighborhood region under study, advanced from a pretest mean score representing mastery of simple topological concepts of order and continuity to the use of "influenced" routes and some beginning transitional concepts of parallelism. Experimental subjects who, like the controls, demonstrated pretest mastery of simple topological concepts demonstrated on the post-test a mean achievement score signifying the development of a partial reference system and of parallelism in organizing geographic data in space. The between-groups difference was statistically significant ($p < .01$).

A significant difference also obtained between experimental and control subjects in their expression of Euclidean concepts of space. Control subjects evidenced a significantly higher mean percentage of responses at the Topological level of the scale (p about .05). Experimental subjects expressed a mean 23.19 percent response at the critical Euclidean level, an achievement significantly different from the 2.78 percent expressed by control subjects ($p < .01$).

Despite these evidences of concept learning, experimental subjects' mean post-test performance did not reach criterion level 6 of the scale. Increments were substantial over subjects' pre-instructional performance, which tested at the beginning levels of topological space relationship. Children did, over the course of the two weeks' instructional program, establish beginning skills in mapping requiring the use of Euclidean concepts of space. The program was of short duration. It would be important

TABLE XVI

CORRELATIONS OF MAPPING SKILLS AND INTELLIGENCE

	N	Mean	r	t
Intelligence				
Total	23	112.3	.396	1.98**
Verbal	23	110.4	.574	3.206***
Spatial	23	109.1	.353	1.747*
Perceptual	23	109.9	.093	0.428

***p <.01

**p about .05

*p <.10

to examine the effects of continued instruction, over a semester's time.

It would be useful, also, to experiment with the development of refined and varied criterion instruments. This research used a single constructive-response instrument only. Our purpose was to observe children's predispositions to patterning geographic spcae under conditions of a minimum of organizational cues. Responses ranged from primitive efforts to connect specific features along a "line of travel," without regard to any outside frame of reference, to complex efforts to structure the entire geographic space in terms of a grid system.

The first six test items required use of the upper half of the map, only. On the seventh question, subjects were instructed to fold back the lower sheet, and study the extended neighborhood. The instructions allowed children time to add streets as needed. Responses varied, and ranged from (1) ignoring the invitation to (2) establishing a new and partial set of space relationships, unrelated to the attached and continuous set already developed on the upper half of the page to (3) extending a coordinate system already established in the upper half of the page to enclose and account for the total region, top and bottom. This final response level corresponds to level 8 of our scale, and to Piaget's definition of Stage IIIB as the expression of a general coordination of all lines and parallels throughout an entire field of objects.

Table XVII presents the number of subjects achieving mean performance at each of the three levels of the scale. Six experimental subjects, and no controls, achieved mean performance at the Euclidean level III of the scale. Achievement in these mapping tasks correlated positively with verbal intelligence ($r = .574$, $p = .01$).

Interpretations of these data are of course restricted by the limited sample, and the above-average mean IQ scores of our first-grade subjects. Clearly, a brief two weeks of instruction demonstrated significant effects, and in the predicted direction. The rating schedule developed for this research incorporated certain transitional concepts advanced by Piaget to expalin children's maturing concepts of space. The scale was useful in differentiating our subjects' responses, and offered a workable definitional framework for categorizing our data. Further study would be required, however, to provide evidence that these levels do indeed constitute a hierarchy of ascending difficulty, and that progress through these levels is as orderly and cumulative

TABLE XVII

DISTRIBUTION OF SUBJECTS BY MEAN CONCEPT LEVEL ACHIEVED ON POST-TEST CRITERION MEASURES OF SPATIAL CONCEPTS IN MAPPING

Concept Level	Experimental N = 23	Control N = 27
Level I Topological	3	14
Level II Transitional	14	13
Level III Euclidean	6	0

as Piaget proposes, and our own study appeared to corroborate.

Most important of our findings was the evidence that children's spatial concepts are amenable to instructional effects. Two weeks of instructional time at 20 minutes per day seems a small investment to make if the outcome is significant growth in children's spatial concepts and ability to order the geographic world. This research focused on certain enabling skills, believed to be prerequisite to the critical geographic tasks of areal analysis. For geographic instruction, the larger worth of this program will rest on its demonstrated value in facilitating those analytic skills. Such follow-up studies must yet be designed.

CHAPTER VII

RESULTS: MAIN EFFECTS FINDINGS

The research design of the Experimental Phase II of this project required pre- and post-test administration of the criterion instrument to all subjects instructed under Curriculums A and B. In addition, all subjects were tested for intelligence, through small-group administration of the Lorge-Thorndike Intelligence Tests, Level 1, Form A (1957) at the grade one level, and Level 2, Form A (1957) at grades two and three.

Trained research assistants administered all tests to the children. The criterion instrument was administered individually in grades one and two, and to small groups in grade three. At no time in the developmental or experimental phases of this research were teachers under Curriculums A or B given access to these instruments. Instructional objectives for their programs were provided, and teachers were assured that the testing program was designed to test for those learnings.

Intact classrooms were used as the experimental unit in this research. Instruction in all grades under both Curricula A and B was conducted by the classroom teacher, with the result classroom interactions might have operated in such a way as to make subjects' scores dependent. Class means, instead, therefore, were used as the sampling units, and were weighted equally in all data analyses.

The major statistical treatment employed in this research was analysis of covariance, with statistical adjustment made for the effects of pupils' mean pre-instructional achievement in geography, as determined by pretest performance on the criterion instrument.

Intercorrelations were computed for pupils' mean IQ, pretest, and post-test achievement. These data are presented in Table XVIII. Pretest scores were selected as covariance controls in adjusting the final criterion scores. Analysis of variance was applied to the adjusted criterion measures, and F tests used to test the significance of the treatment difference at each grade level, and for each level of geographic achievement (knowledge, comprehension, and application).

FINDINGS

Results in Knowledge of Geographic Features and Functions

It was hypothesized that no significant difference would obtain between groups in subjects' knowledge of geographic features and their functions in the geographic landscape. Both curricula, it was anticipated, would prove effective in familiarizing children with the natural and the cultural features of the landscape, and with their geographic functions.

Results of analyses of covariance in testing the significance of between-programs differences are presented in Table XIX. The no-difference hypothesis was supported in grades 1 and 3. In grade 2 a statistically significant between-programs difference was obtained ($P < .05$). In grade 2, the null hypothesis was, therefore, rejected.

Table XX presents means and standard deviations of subjects' post-test achievement for all three sub-tests of the criterion instrument. Table XXI presents mean pretest achievement and unadjusted and adjusted means of subjects' criterion performance on subtest I (knowledge) under Curriculums A and B.

On the criterion sub-test of 36 items, first grade subjects obtained post-test mean achievement of 27.5 in Curriculum A and 23.6 in Curriculum B. On the same sub-test items, second grade subjects obtained mean post-test achievement of 30.3 in Curriculum A and 24.1 in Curriculum B. On the third grade sub-test I, with a total of 32 items, Curriculum A and B subjects achieved virtually the same mean post-test scores (19.2 and 19.1, respectively.)

With no correction for guessing, chance scores on the three instruments are the following: 9 for the grade 1 and 2 sub-tests; 8 for the grade 3 sub-test. Subjects' mean performance at all three grades, and under both Curriculums A and B, demonstrate considerable increments over chance achievement.

TABLE XVIII

CORRELATIONS BETWEEN SUBJECTS' INTELLIGENCE SCORES, PRETEST, AND POST-TEST ACHIEVEMENT IN GEOGRAPHY

	Level I. Knowledge		Level II. Comprehension		Level III. Application	
	Pre	IQ	Pre	IQ	Pre	IQ
Grade 1						
Post	.926**	.097	.305	.360	.409	.348
Pre		.533		.878**		.975***
Grade 2						
Post	.734*	.319	.715	-.231	.116	-.179
Pre		.861**		.473		.886**
Grade 3						
Post	.680	.750*	.105	-.492	.552	-.519
Pre		.990***		.771*		.183

One tailed test * p <.05
** p <.01
*** p <.001

TABLE XIX

SUMMARY OF ANALYSES OF COVARIANCE OF CHILDREN'S ACHIEVEMENT IN GEOGRAPHY. I: KNOWLEDGE OF FEATURES AND FUNCTIONS

Source	df	Mean Square	F
Grade 1			
Programs	1	3.814	2.145
Within	1	1.778	
Total	2		
Grade 2			
Programs	1	41.547	2769.800*
Within	1	0.015	
Total	2		
Grade 3			
Programs	1	2.143	38.267
Within	1	0.056	
Total	2		

*P < .05

TABLE XX

MEANS AND STANDARD DEVIATIONS OF SUBJECTS' POST-TEST ACHIEVEMENT ON THREE LEVELS OF THE CRITERION INSTRUMENT

	N	Sub-Test I[1] $\bar{X}$	Sub-Test I[1] S.D.	Sub-Test II[2] $\bar{X}$	Sub-Test II[2] S.D.	Sub-Test III[3] $\bar{X}$	Sub-Test III[3] S.D.
Grade 1							
Curriculum A	2	27.5	3.81	15.1	3.89	20.4	5.62
Curriculum B	2	23.6	3.13	10.1	3.21	9.9	6.22
Grade 2							
Curriculum A	2	30.3		21.5		37.1	
Curriculum B	2	24.1		9.6		19.6	
Grade 3							
Curriculum A	2	19.2	2.19	12.0	2.17	10.6	2.12
Curriculum B	2	19.1	2.45	5.4	2.03	7.7	2.55

[1]Knowledge of Geographic Features and Functions

[2]Comprehension of Concepts of Areal Association

[3]Application of Concept of Areal Association

TABLE XXI

SUBJECTS' CRITERION AND CONTROL VARIABLE MEANS FOR BETWEEN-PROGRAMS ANALYSES OF ACHIEVEMENT IN GEOGRAPHY: I. KNOWLEDGE OF FEATURES AND FUNCTIONS

Group	N[1]	IQ	Criterion: Post-Achievement un-adjusted	adjusted[2]	Control: Pretest Achievement
Curriculum A					
Grade 1	2	105.2	27.5		11.3
Grade 2	2	99.5	30.3	30.4	12.2
Grade 3	2	96.2	19.2		8.5
Curriculum B					
Grade 1	2	110.1	23.6		9.7
Grade 2	2	106.7	24.1	23.9	12.3
Grade 3	2	104.2	19.1		10.3

[1]Number of intact groups serving as sampling units.

[2]Adjustments made where statistically significant F values obtained.

Results in Comprehension of the Concept of Areal Association

It was hypothesized that subjects enrolled in Curriculum A would evidence significantly higher achievement on post-test measures of comprehension of the concept of areal association than would subjects in Curriculum B. Table XXIII presents unadjusted and adjusted criterion means. Results of analyses of covariance for grades 1, 2, and 3 are presented in Table XXII.

The between-programs difference in Grade 1, while in the predicted direction, failed to reach statistical significance ($F = 15.357$). First grade subjects instructed in a program designed to give instruction in the concept of areal association did not achieve significantly higher mean achievement in comprehension of the concept than did subjects instructed in Curriculum B, the generalizations-centered curriculum.

In grades 2 and 3, significant between-programs differences did appear ($P < .05$). In both grades, subjects instructed in the concept of areal association demonstrated significantly higher mean achievement on a test measuring comprehension of the concept than did subjects enrolled in Curriculum B.

With no correction for guessing, chance scores on criterion sub-test II at all three grades would be 6. Third grade mean achievement under Curriculum B failed to reach chance level ($\overline{X} = 5.4$). In grades two and three, subjects instructed in a generalizations-centered curriculum achieved significantly lower scores on sub-test II than did those instructed in the analytic Curriculum A. Between-groups differences were, in both cases, statistically significant ($P < .05$).

Results in Ability to Apply the Concept of Areal Association in Regional Analyses

The third hypothesis of this research was in the null form, and stated no significant between-programs difference would obtain in subjects' mean performance in ability to apply the concept of areal association in interpreting the data of unfamiliar geographic regions.

Table XXV presents unadjusted and adjusted criterion means. Results of analyses of covariance for grades 1, 2, and 3 are presented in Table XXIV. The difference between first grade subjects' post-test mean achievement under programs A and B was 10.5 score points. Subjects under Curriculum A obtained a mean

TABLE XXII

SUMMARY OF ANALYSES OF COVARIANCE OF CHILDREN' ACHIEVEMENT IN GEOGRAPHY. II: COMPREHENSION OF THE CONCEPT OF AREAL ASSOCIATION

Source	df	Mean Square	F
Grade 1			
Programs	1	28.211	15.357
Within	1	1.837	
Total	2		
Grade 2			
Programs	1	73.704	279.181*
Within	1	0.264	
Total	2		
Grade 3			
Programs	1	44.844	3,449.538*
Within	1	0.013	
Total	2		

*P <.05

TABLE XXIII

SUBJECTS' CRITERION AND CONTROL VARIABLE MEANS FOR BETWEEN-PROGRAMS ANALYSES OF ACHIEVEMENT IN GEOGRAPHY. II: COMPREHENSION OF THE CONCEPT OF AREAL ASSOCIATION

Group	N[1]	IQ	Criterion: Post-Achievement un-adjusted	Criterion: Post-Achievement adjusted[2]	Control: Pretest Achievement
Curriculum A					
Grade 1	2	105.2	15.1		4.7
Grade 2	2	99.5	21.5	20.5	6.3
Grade 3	2	96.2	12.0	12.0	4.1
Curriculum B					
Grade 1	2	110.1	10.1		5.2
Grade 2	2	106.7	9.6	10.6	5.5
Grade 3	2	104.2	5.4	5.3	4.1

[1]Number of intact classes serving as experimental units.

[2]Adjustments made where statistically significant F values obtained.

TABLE XXIV

SUMMARY OF ANALYSES OF COVARIANCE OF CHILDREN'S ACHIEVEMENT IN GEOGRAPHY. III: APPLICATION OF THE CONCEPT OF AREAL ASSOCIATION

Source	df	Mean Square	F
Grade 1			
Programs	1	110.010	3.566
Within	1	31.128	
Total	2		
Grade 2			
Programs	1	336.941	329.687*
Within	1	1.022	
Total	2		
Grade 3			
Programs	1	6.497	360.944*
Within	1	0.018	
Total	2		

*$P < .05$

TABLE XXV

SUBJECTS' CRITERION AND CONTROL VARIABLE MEANS FOR BETWEEN-PROGRAMS ANALYSES OF ACHIEVEMENT IN GEOGRAPHY: III. APPLICATION OF THE CONCEPT OF AREAL ASSOCIATION IN REGIONAL ANALYSES

Group	N[1]	IQ	Criterion: Post-Achievement un-adjusted	adjusted[2]	Control: Pretest Achievement
Curriculum A					
Grade 1	2	105.9	20.4		5.6
Grade 2	2	99.5	37.1	37.6	6.9
Grade 3	2	96.2	10.6	10.5	2.3
Curriculum B					
Grade 1	2	110.1	9.9		5.6
Grade 2	2	106.7	19.6	19.0	7.2
Grade 3	2	104.2	7.7	7.8	1.9

[1]Number of intact classes serving as sampling units.

[2]Adjustments made where statistically significant F values obtained.

post-test score of 20.4, and those under Curriculum B, 9.9. The between-programs difference did not reach statistical significance, however, and the null hypothesis, therefore, was not rejected.

In grades 2 and 3, between-programs differences each reached statistical significance ($P < .05$). Under Curriculum A, second and third grade subjects evidenced a significantly higher mean achievement in ability to apply the concept of areal association in analyzing unfamiliar geographic regions. The advantage for Curriculum A with respect to this geographic operation was not obtained, however, with first grade subjects in this research.

CHAPTER VIII

DISCUSSION

This research was directed to a central and pressing issue in curriculum today: the question whether young children can profit from instructional programs incorporating, in their objectives, the central organizing knowledge systems constituting the "structure" of the disciplines. Currently, widespread support has been given to the proposal that these central concept-systems of the disciplines are best introduced early in children's learning experiences. These substantive elements, it is claimed, constitute the most powerful ideas of the disciplines, are of heuristic worth, and facilitate all continuing learning in these disciplines.

Whether young children can acquire these learnings is, however, a question for which evidence is largely lacking. Under what programs such learnings can be attained, by what populations of learners, and to what levels of complexity are questions urgently in need of study. They are the questions to which this research was directed.

To submit these questions to experimental study, we developed two curricula, premised upon two different but widely accepted definitions of what constitutes "structure" in a field of knowledge. By one definition, "structure" consists of the central organizing concepts of a field, together with the analytic methods (the "proof processes") which direct its inquiries. By another definition, structure consists of the tested knowledge of a field: its fund of related generalizations, laws, or principles widely accepted by scholars in the discipline.

In Curriculum A of this research, structure was defined as the core of organizing concepts which direct geographic inquiry, together with the analytic tools or methods of the discipline. In this curriculum the central concept "areal association" was developed, through inquiry into patterns of accordance, interaction, and causality in the distribution of features in the geographic landscape. The analytic operations engaged in were derived from the analytic processes of geographic inquiry and included the following: (1) selective observation of the geographic features under study; (2) classification of those data into concept-categories constructed and defined with relevance to the inquiry underway; (3) analysis of patterns of accordance, interaction, and causality in the distributions of geographic features within and between regions; (4) formulation of hypotheses and generalizations concerning geographic phenomena, and testing through inter-regional contrastive analysis; (5) inferring, through deductive logic, the necessary consequences of predictions following from inductively-inferred premises, as a means to theory validation or revision, and the extension of geographic knowledge.

Curriculum A used these analytic inquiry processes as data sources in the formulation of its instructional objectives, and introduced authentic, though simplified, geographic tools and data resources in its instructional programs.

In Curriculum B structure was defined as a core of geographic generalizations, widely accepted by scholars in the field as representative of the body of tested knowledge produced by geographic research. In this curriculum children were presented with examples of geographic relationships from which these generalizations could be inferred. Methodologically, Curriculum B used an inductive instructional approach, and engaged children in formulating, under teacher guidance, geographic generalizations from the data-examples of geographic relationships given to them.

Induction, as instructional method, is widely subscribed to as an effective approach in the early years of elementary schooling. In Curriculum B, teachers were informed that geographic knowledge, in the form of three selected generalizations, was to be the "end-point" of instruction. Curriculum B did not engage children in the analytic operations of geographic inquiry. Geographic generalizations, once inferred from limited instances, were not submitted to further analytic test, requiring: (1) predicting, through deductive logic, the necessary events which should hold true if the premise were valid; and then (2) testing the validity of the premise against the data of the new geographic event, and revising on the basis of the facts obtained. Inductive method is, on the contrary, limited to formulating a premise on the basis of given instances alone. Induction or "discovery" processes do not incorporate the self-correcting methods of analytic inquiry, though they do incorporate important processes of inductive logic. It was those processes (drawing reliable inferences from data given) that alone formed the behaviorable elements of Curriculum B.

Data obtained in this research permit comparative analysis of the effects of Curriculums A and B at each of three levels of geographic achievement, at each of grades one, two, and three. The data do not permit comparison of these effects with those obtained under conditions of "no instruction." No uninstructed control group was used. However, comparisions of children's achievement on the criterion instrument against chance performance as well as against a defined criterion level are possible, and permit judgments concerning the instructional significance of these curricula.

Main effects findings obtained after 16 weeks' instruction in Curriculums A and B are perhaps most interesting when viewed by grade level. No significant between-programs difference was anticipated, at any grade level, in children's knowledge of geographic features and functions. It was anticipated that both programs A and B would involve children in the observation and analysis of geographic features and their functions in the regions studied. As predicted, no significant between-programs difference was obtained in children's knowledge of geographic features and functions in grades one and three. Interestingly, a significant between-programs difference did obtain in grade two ($P < .05$). Children instructed in Curriculum A, the analytic curriculum, did achieve significantly higher post-test criterion means than did children instructed in Curriculum B.

Achievement in knowledge of geographic features and functions was significantly above chance performance level at all three grades, under both Curricula A and B. (Table XXVI.) Both Curricula A and B could be considered instructionally significant, therefore, in eliciting above-chance achievement in knowledge of geographic features and functions.

Regarding children's comprehension of the core concept of geographic theory--the concept of areal association--it was hypothesized that children enrolled in Curriculum A would evidence significantly higher post-test achievement than would children enrolled in Curriculum B. Both curricula incorporated the concept of areal association within their instructional programs, but did so under different instructional plans. Curriculum A engaged children in the analytic operations of classifying observed geographic data, and actively seeking and verifying patterns of association (correspondence and causality) in the distributions of those data within and between regions and over historical time. Curriculum B presented instances of these relationships to children, and evoked their synthesis of the "big idea" or generalization illustrated by these relationships.

TABLE XXVI

SUBJECTS' MEAN ACHIEVEMENT
UNDER CURRICULUMS A AND B
WITH CHANCE SCORES FOR SUB-TESTS I, II, AND III

	Number of Test Items	Curriculum A Mean	Curriculum B Mean	Chance Score[1]
Grade I				
Sub-test I	36	27.5	23.6	9
Sub-test II	24	15.1	10.1	5.3
Sub-test III	24	20.4	9.9	-
Symbolic		6.6	4.1	3.5
Air Photo		13.8	5.8	-
Grade II				
Sub-test I	36	30.3	24.1	9
Sub-test II	24	21.5	9.6	5.3
Sub-test III	42	37.1	19.6	-
Symbolic		17.7	12.7	8.0
Air Photo		19.4	6.9	-
Grade III				
Sub-test I	32	19.2	19.1	8
Sub-test II	24	12.0	5.4	6
Sub-test III	16	10.6	7.7	4

[1]No correction for guessing.

The predicted between-programs difference was obtained in grades 2 and 3, where the difference was statistically significant at the .05 level. Children instructed in Curriculum A evidenced significantly higher post-test achievement in comprehension of the concept of areal association than did children in Curriculum B. In grade 1 a between-programs difference was obtained in children's comprehension of the concept of areal association. First grade subjects achieved, on the comprehension sub-test, a post-test mean of 15.1 under Curriculum A and 10.1 under Curriculum B. The difference, while in the predicted direction, was not, however, statistically significant.

"No-difference" results such as this are always difficult to interpret. It is possible, for example, that the small sample was a factor in these findings. Since in grades 2 and 3, however, where statistically significant between-programs differences were obtained, a similar sample size was used, it is important to consider other factors.

Areal association is a concept requiring the ability to engage in relational thinking concerning the distribution and patterns of association of geographic features in the landscape. In this research, comprehension of the concept of areal association required relational thinking concerning patterns of covariant (accordant) and causal interaction between features within and between regional complexes. Relationships of covariance and causality are examples of what Goss (8) has classified as the most complex in a hierarchy of conceptual systems. To "think geographically"--that is, to determine patterns of correspondence and causality within regions--requires that children be engaged in relatively difficult cognitive operations.

In grades 2 and 3 Curriculum A elicited significantly higher increments in these thinking operations than did Curriculum B. In these two grades the analytic operations of Curriculum A, which gave practice to classification and contrastive analysis, were more effective in facilitating children's learning of the relational concept of areal association than were inductive operations of Curriculum B.

It is possible that one contributing factor to the first grade findings, where the difference obtained on this same criterion behavior was not significant, was the fact the analytic Curriculum A at grade one provided fewer opportunities for contrastive analysis. The systematic between-regions analyses developed throughout grades two and three were not possible in grade one, where the curriculum focused on within-regions analysis, only. It would seem reasonable to assume one factor in these findings may be the grade-level differences in the operations actually practiced. It would be hazardous, however, to infer that increased opportunities in inter-regional analysis would have elicited in grade one subjects the same increments in concept-comprehension as those produced in grades 2 and 3. Observation of first grade subjects' responses to the analytic tasks of Curriculum A led our research and teaching staffs to conclude this curriculum provided as extended a program in contrastive analysis as these children could cope with.

The region serving as the "datum-plane," against which contrasting examples were to be compared, had to be within children's understanding. The models, which reproduced at relatively large scale (1:300) the streets and structures of these regions, permitted children's manipulation of these features, and their simulation of patterns of interaction (economic and transportation activities, for example) within and between these regions. These resources allowed, therefore, considerable perceptual support to concept development, and permitted children's recognition, at highly "concrete" levels, of patterns of interaction within the geographic environment.

These arrangements, facilitating concrete operations as a support to conceptual thinking, were possible so long as the geographic region was clearly representative of a real place, and was reproduced at a scale permitting children's manipulation of specific features within the regional complex.

To support transition to increasingly symbolic modes of presentations, these geographic models were systematically reduced in scale, and "magnetized" through use of magnetic tape attached to the base of each structure, so that the board with its street pattern and its regional structures could together be raised upright, and set side by side with a highly-pictorial map representation of the same regional area. Subsequently, increasingly symbolic map symbols were introduced.

Considerable individual variability was evidenced in first graders' ability to analyse geographic patterns within these regions. Data obtained from one important smaller research of this study, concerned with children's use of coordinate reference systems in mapping, (Chapter VI of this report) indicate that first grade subjects made statistically significant gains in their mapping skills, through the materials of this project. Subjects, with a mean IQ score of 109 on a group-administered intelligence test, did not, however, reach criterion performance level in their mastery of euclidean space relationships. Twenty-six percent of the instructed children, and none of the controls, achieved mean performance at the euclidean level, implying mastery of a system of stable space relationships, defined through a grid system accounting for positional relationships throughout the spatial field. Interestingly, children's achievement in these spatial concepts in mapping correlated positively with verbal intelligence ($r = .574$, $P < .01$).

It seems reasonable to suggest that children who did not "see" the region as a spatial system would be unlikely to determine patterns of correspondence in the distribution of two or more features associated within that region. Children operating at "topological" and "transitional" levels in their concepts of space were observed to change reference systems, and to ignore the frame of reference of one set of place locations in considering another. Until a stable system of space relationships was developed, the child was seriously handicapped in imposing conceptual order upon the features distributed within space.

A factor contributing to the "no-significant-difference" findings at the grade one level may, therefore, have been one of individual differences in subjects' ability to engage in the thinking operations these geographic tasks required. Piaget (12), Danziger (5), and Wohlwill (27) have all found relational thinking developing within these years of early schooling, and have reported a sequence in children's conceptual thinking, proceeding from children's early perceptually bound, precategorial responses through later stages of increased symbolic mediation and the recognition of interrelationships between factors in the concept-systems developed. Variability in the onset of these stages in concept learning has been reported, however, and was found related to IQ, verbal fluency, and general experiential background.

In this research a similarly significant correlation was obtained between IQ and post-test scores in comprehension of the relational concept of areal association of first grade subjects instructed in Curriculum A. The correlation was .50 ($P < .05$).

This research stratified subjects by grade level, but not on individual variables. It would be useful to have evidence, now, of the effects of analytic Curriculum A on first grade children's learning of relational concepts, with subjects stratified by IQ as well as age or grade. The positive and significant correlations between (1) IQ and children's spatial concepts in grade one, and between (2) IQ and children's comprehension of the concept of areal association would indicate the usefulness of further research concerning within-class variability in first graders' achievement in comprehension of relational concepts.

Date of Table XXVI indicate that both Curricula A and B effected above-chance performance in first and second grade children's comprehension of the concept of areal association. Third graders instructed in Curriculum B did not exceed an achievement level which could be attributed to chance alone. Perhaps most interesting of these data is the observation that first and second grade children instructed in Curriculum B achieved about the same post-test mean achievement on the same comprehension subtest. Under Curriculum A, performance at all three grade levels was superior to that elicited under Curriculum B, though only at grades two and three did the between-programs difference reach statistical significance.

The third sub-test of the criterion instrument measured children's ability to apply the concept of areal association in regional analyses of unfamiliar geographic regions. Statistically significant between-programs differences were again obtained in grades 2 and 3, where subjects instructed under Curriculum A achieved significantly higher mean post-test achievement than did those instructed under Curriculum B. Again, first grade subjects achieved a higher mean post-test achievement score under Curriculum A (Mean = 20.4) than under Curriculum B (Mean = 9.9), but the difference failed to reach statistical significance.

These findings are consistent, and predictable, from the findings regarding children's achievement in comprehension of the concept of areal association. The Taxonomy of Educational Objectives (1) defines application as behavior incorporating both knowledge and comprehension, the two preceding cognitive operations in a scale of ascending difficulty. Children, successful in mastering the concept at the comprehension level, would be advantaged in those tasks requiring application of that concept in the unfamiliar analytic task.

Table XXVII, which presents the intercorrelations of subtests of the criterions instrument, illustrates the positive correlations obtaining between comprehension and application at all three grade levels. Consistently higher correlations obtained in the case of Comprehension-Application than in the case of Knowledge-Application. Understanding the relational concept contributes more to the variance of application behavior than does having knowledge of specific geographic features.

Determining the instructional significance of Curriculums A and B on children's ability to engage in appropriate application of the concept of areal association is made somewhat difficult by the fact the sub-test was composed of (1) multiple-choice pictorial and symbolic items, and (2) a constructive-response air photo test, graded against a scale which rated responses along a continuum from a minimum to an optimum response. Table XXVI therefore presents subjects' mean responses for Curriculums A and B at two levels of sub-test III: a mean score for total pictorial and symbolic items, which can be judged against a score obtainable by chance alone; and a mean score for air photo regional analysis, which can be judged against a fixed criterion, defining an acceptable level of achievement in air photo analysis.

On the multiple-choice application items, subjects at all grades achieved significantly higher than chance scores under Curriculum A. In grade 1, under Curriculum B, children's mean score on multiple-choice application items did not differ significantly from chance.

To score the air photo items, subjects' responses were rated on the Air Photo Rating Scale (Figure 6). On this scale, criterion performance was established at level 5, denoting a grouping response enclosing a majority of the associated structures defining a geographic region. This test presented children with two unfamiliar regions, one incorporating single and multiple residences, two commercial districts, and an industrial region, and a second incorporating three zones of a Central Business District, and its surrounding residential and arterial-commercial neighborhoods. Both air photos posed difficult analytic tasks. Because of the nature of these regions, they are separately compared below.

Table XXVIII presents subjects' mean rating score for air photo analysis on the two air photos, under Curriculums A and B. In all cases the higher mean scores were achieved on air photo I, representing the residential, commercial, and industrial regions. Lower mean scores were achieved on air photo II, where the test measured children's ability to apply the concept of areal association in the analysis and differentiation of separate zones within an unfamiliar Central Business District.

In no instance did children's mean achievement reach criterion level 5 of the rating scale. Individual variability was high.

TABLE XXVII

INTERCORRELATIONS[1] OF SUB-TESTS
(KNOWLEDGE, COMPREHENSION, APPLICATION)

Grade	N	K - C	K - A	C - A
1	47	.451	.335	.451
2	51	.682	.659	.684
3	57	.454	.054	.255

[1]Pearson Product Moment Correlations

TABLE XXVIII

SUBJECTS' MEAN AIR PHOTO ANALYSIS SCORES
ON TWO TASKS OF REGIONAL ANALYSIS

	Regional Analysis (Residential-Commercial -Industrial)	Within-Region (CBD) Analysis (Core-Secondary-Tertiary)
Grade I		
Curriculum A	2.62	1.48
Curriculum B	1.39	0.43
Grade II		
Curriculum A	4.16	1.73
Curriculum B	1.39	0.66

In no instance did first grade subjects achieve a mean score denoting more than a minimum grouping response. In grade one, Curriculum A did not yield significantly higher scores than Curriculum B, when subjects' mean performance is judged against a defined criterion achievement level.

Highest achievement was obtained under Curriculum A, with second grade subjects, in the analysis of separate residential, commercial, and industrial regions. This mean achievement score (4.16) is similar to that obtained by instructed second grade subjects in the experimental study of children's learning of the skills of air photo analysis (Chapter V of this report.) Difficulty indices for these several test items indicate these to be considerably difficult test items. The selection of a wider range of air photos could conceivably have yielded somewhat higher mean criterion scores than those reported here.

Perhaps most interesting of the grade one effects of Curriculum A on children's application behaviors were those observed during the development of the teaching programs themselves. Intercorrelations between sub-test scores demonstrate statistically the facilitating effects of comprehension of the concept of areal association on children's ability to apply that concept in new regional analyses. It was a facilitating effect we observed again and again in the studies underway. The claim by those advocating teaching the "structure" of the disciplines--namely, that the organizing concepts of a field are heuristic, and facilitate continuing inquiries--seemed well demonstrated in episodes such as the following.

> Children from one of our grade one Curriculum A classrooms had completed field study of the residential and neighborhood commercial districts in their home community (Malibu). This is a coastal region of mountainous ridges and valleys, where homes follow the ridges and slopes, and the shopping center is developed on the flat coastal strand fronting the highway paralleling the beach. They had studied associations of topography and settlement patterns, and learned the concept "coastal strand" as a particular kind of physical region. On the day of this particular anecdotal account, the class was on a field trip, moving south on Highway 101, to the city of Santa Monica. The bus swung up onto the bluffs and parked at the summit of the palisades. The children were asked to leave the bus and to gather in a group outside. They moved toward the rail, and looked down on the highway and beachfront several

hundred feet below. One was heard to say, "Gee, look what they've done to the coastal strand here!" Others joined the discourse, and began pelting the teacher with queries. Their questions formed the nucleus of continuing inquiries in the lessons which followed.

In this particular episode it was the application of the organizing concept, "areal association" that permitted children, without guidance from their teacher, to note what was geographically significant about this place, and to formulate the productive questions which, answered, would lead to understanding of the particular patterns of association which interested them here.

Similarly, on other field-study excursions, we observed children noticing, from the bus window, the changing urban scene outside, and commenting, without teacher solicitation or guidance, "Look, the region is changing! It isn't commercial anymore!" "No, it's industrial." And, though no study of the industrial region had been introduced, these first graders engaged in an eager and animated discussion of what features seemed to be "associating" in this new region they were describing for themselves.

One other example occurred again in a first grade classroom, where children were studying an air photo of the region near their school. They were perplexed because none could locate the large condominium (an "own-your-own" apartment complex) which had just been completed on a promontory not far from the school. One said, "This photo isn't right. The condomimium isn't here." Another suggested, "Maybe the camera was broken." Another said, "Maybe the picture got ruined. See, it's smudged here." A fourth said, "Hey, no, look! The ground is <u>cleared</u>, there. See? You can see how the tractor went. I bet this is an <u>old</u> picture." Then, addressing the teacher, "Say, is this an old picture? Is this before the condominium was built?"

The teacher asked, "How could you find out?"

The children replied, "I don't know." "Ask the photographer." "Wait, I have an idea! Look, the road is different now. This is the way it used to go - I bet this <u>was</u> before. . . " Once again, children were seeking patterns of association in regions, to account for change, today and in days past.

It was this behavior which was measured in Sub-test III (Application) of our criterion scale. Children, in order to predict changes in land usage, or possible locations of selected features in the urban and rural landscape, had to make use of the concept of association in the patterning of man's works upon the land. Ability to engage in this application behavior was achieved significantly above chance level under Curriculum A in all three grades. Only in grade one did the between-programs (A and B) difference in children's post-test means on Sub-test III fail to reach statistical significance.

CHAPTER IX

CONCLUSIONS AND IMPLICATIONS

In analyzing outcomes of this research, it is important to point out certain limitations on interpretations which can be drawn from these data. This was one experimentally conducted research concerning effects of two social studies curricula on children's concept learning in geography. The sample, while representative of socioeconomic levels of Los Angeles County, was relatively small. Twelve classooms constituted the sampling units.

The possibility of uncontrolled factors in classroom research was of course present. Teachers involved in this research were selected by their curriculum supervisors and school administrators as a group of outstanding, experienced primary teachers in a school district widely recognized among teachers and employment personnel as a forward-looking and professionally desirable system in which to teach. Teachers were randomly assigned to programs, after they had expressed interest in participating in a project in geographic education. Teachers under both programs were enrolled in separate summer session workshops to prepare them for the programs they were to teach. Throughout the experimental period teachers regularly attended institute sessions which carried credit for professional advancement within their school district, and which were designed to facilitate the week-by-week development of these separate programs. Through a variety of methods, therefore, efforts were made to facilitate effective teaching under both curricula, and to control against any systematic differences between programs other than the critical curriculum variable of this research.

The major findings of this research were the following:

(1) Both the analytic Curriculum A and the generalizations-centered Curriculum B effected above-chance performance at all three grades (1, 2, and 3) in children's mean achievement on a criterion instrument measuring knowledge of geographic features and functions. No significant differences obtained between children's learning under Curricula A and B in grades one and three. A statistically significant between-programs difference was obtained in

grade two, where children instructed under analytic Curriculum A evidenced significantly higher post-test achievement than did second-graders instructed under Curriculum B.

(2) In grades 2 and 3 children instructed under analytic Curriculum A evidenced significantly higher post-test achievement means on a criterion instrument measuring comprehension of the concept of areal association than did children instructed under Curriculum B.

Curriculum A, which engaged children in the analytic operations of classifying geographic data, and actively seeking and verifying patterns of association (correspondence and causality) in the distributions of geographic data, was more effective in fostering children's learning of the concept of areal association than was the generalizations-centered Curriculum B.

Curriculum A was, further, instructionally significant in eliciting mean post-test performance significantly above chance level in both grades 2 and 3. Third grade subjects' mean post-test achievement under Curriculum B was not significantly above chance level.

(3) In the case of first grade subjects, the between-programs difference in children's comprehension of the concept of areal association was not significant. Subjects enrolled in Curriculum A achieved the higher mean post-test scores, but the difference between Curriculum A and B post-test means in grade one did not reach statistical significance.

A significant correlation was obtained between IQ and post-test scores in comprehension of the concept of areal association of first graders instructed under Curriculum A ($r = .50$, $P < .01$).

(4) In grades 2 and 3 children instructed under analytic Curriculum A evidenced significantly higher post-test achievement means in ability

to apply the concept of areal association in regional analyses of unfamiliar geographic regions than did children instructed under Curriculum B.

(5) In grade 1 children instructed under Curriculum A achieved higher post-test mean performance in application of the concept of areal association than did subjects instructed under Curriculum B. The between-programs difference however, was not statistically significant.

Concerning these findings, certain limitations and directions for continued research should be noted. This study employed two curriculums of sixteen weeks duration, only. What the effects might have been, had instruction been continued for one school year cannot be estimated from this research. Particularly important, subjects in Curriculums A and B both, were introduced to new instructional programs. What might be the result at the second and third grade levels, were children engaged in a consistent, three-year curriculum under the arrangements of programs A and B cannot, again, be determined from these data.

One of the most important, newer emphases in social studies curriculum development is the effort to develop articulated programs for continuous concept-learning. The sequence of experimental curriculums developed for this research is premised on the curriculum principle of continuity in concept-learning. In the experimental stage of this research, however, no tests were possible of the cumulative effects obtained over three years' time under either Curriculum A or B. Subjects enrolled in the second and third year curriculums were without benefit of antecedent instruction in the particular curriculum in which they were enrolled. Continued study, therefore, is essential if the long-term effects of these programs are to be known.

A second need for continued research derives from the first grade findings of this study. In grades 2 and 3 the data of this research demonstrate that children at these ages can learn the central concept system of geographic theory, and can apply it appropriately in analyzing unfamiliar geographic regions. Children's mean achievement on sub-tests measuring comprehension of the concept and ability to apply that concept in unfamiliar regional analyses was significantly above chance performance level, and was significantly higher under Curriculum A.

In grade one the same pattern of responses occurred. Mean achievement was higher under Curriculum A for both children's comprehension of the concept of areal association and their ability to apply the concept in unfamiliar regional analyses. The between-programs differences did not achieve statistical significance, however.

Obtained correlations between instructed first graders' IQ and achievement in spatial (euclidean) concepts in mapping and between IQ and children's comprehension of the concept of areal association were both statistically significant. Continued studies with first grade subjects stratified on the basis of IQ would be useful. Clearly Curriculum A achieved significant instructional effects in grade one in children's learning of the concept of areal association. The relative effectiveness of the curriculum with specific sub-populations of learners cannot appropriately be determined from the design of this research, however, and would be data of considerable importance in reaching teaching decisions regarding the wider application of these methods of Curriculum A in the schools.

Particularly is there need for study of criterion behaviors practiced in the analytic Curriculum A but not specifically measured in this research. This research examined three behaviors defined by Bloom and others (1). The smaller researches reported in Chapters V and VI of this report give evidence of some effects of Curriculum A on children's classification and spatial concept learnings. Higher analytic processes, such as hypothesis-making, theory validation, and evaluation, as well as specific processes in multiplicative contrastive analysis and deductive logic involved in the analytic mode were not tested in this research. They suggest the urgency of continued studies in this field.

CHAPTER X

SUMMARY

The purpose of this research was to submit to experimental study a central issue in elementary school social studies education. The question concerns the effects of teaching young children the substantive content and methods of the social sciences. Currently, widespread support has been gained for the proposal that key concepts, derived from the "structure" of the disciplines, are best introduced early in young children's learning experiences. These concepts, established in the early grades, it is claimed, will facilitate continuous learning within the disciplines over the elementary school years.

Whether young children can learn the concepts being proposed is a researchable question. There is, at the present time, however, relatively little research to be offered in support or reproof of these suggestions as they apply specifically to the social studies program in the elementary school. A number of basic researches, extending Piaget's earlier studies, have affirmed a developmental order in children's acquisition of abstract, symbolically mediated concepts. Concept formation has been observed to proceed from children's early perceptually bound, precategorial responses through later stages of reduced perceptual support and increased symbolic mediation(27). In their acquisition of social concepts, children have been observed to respond in precategorial and categorial terms before recognizing, at later age levels, systems of reciprocal interaction between variables in the concepts tested(5). Unfortunately, few studies have raised the question whether classroom instructional programs may effect the earlier emergence of those same concepts, nor have they studied what influences different instructional approaches might have on the development of higher order conceptual systems. It was these questions that directed the development of this research.

The Research Design

This research was designed to study children's learning of a major conceptual system in geography. Specifically, this research was directed to the question whether young children could learn a central concept of geographic theory, and could learn to apply it appropriately in interpreting the data of unfamiliar geographic regions.

Experimental Curriculums A and B

Two experimental curricula were designed and introduced into twelve intact primary classrooms, matched for grade level and randomly assigned to each curriculum. Both programs gave sixteen weeks' instruction in geography, and utilized for that purpose study of the immediate urban environment, selected on the advice of professional geographers as the best possible laboratory for beginning geographic analysis.

The differentiating feature distinguishing between Curriculums A and B was the definition of "structure" used, in deriving the objectives of the programs. There is, in the social studies, considerable disagreement concerning what constitutes the "structure" of these disciplines. Structure has been defined as the organizing concepts of a field, the major generalizations of a field, (defining its generally agreed-upon body of knowledge), the analytic methods or tools of a discipline, or some combination of these elements. In this research two approaches were taken to the definition of structure: for Curriculum A, the major organizing concept of the discipline (the concept of "areal association") together with the analytic processes which direct geographic inquiry; for Curriculum B, the major generalizations, widely accepted among geographers as a statement of selected, tested knowledge in their field. Implications of these differentiating characteristics of Curriculums A and B are described below.

Curriculum A was designed to teach children the geographic concept of areal association by engaging children in the geographic operations of (1) examining areal associations of features in selected regions, and (2) analyzing how those features "associated" in the landscape. Patterns of areal association analyzed were of three kinds: (1) patterns of correspondence in the distributions of two or more features within a region; (2) patterns of functional interrelationship between features within and between regions; and, (3) evidences of causal relationships, in the changing distributions of features, over time.

These analyses were introduced in the three experimental Curricula A as follows:

Grade 1: Functional studies of the neighborhood and its relationships with the larger urban-industrial complex. Emphasis on patterns of association between geographic phenomena interrelated in place.

Grade 2: Comparative studies of the extended urban-industrial complex, with emphasis on patterns of association between geographic phenomena functionally interrelated between places.

Grade 3: Historical studies of sequent occupance in the region, with emphasis on factors accounting for change in distributions of geographic features, over time.

The instructional program at all grades made use of newly developed materials, designed to clarify systems of relationship between geographic features in the regions studied. Because these are the years (grades one through three) frequently characterized as the "stage of concrete operations" (12, 3), instructional materials were designed to give children opportunity to examine geographic features and their interrelationships at levels of high perceptual support before their symbolic representations were presented. Materials included photographs, large, moveable three-dimensional models of the features and topography of each region studied, raised magnetic-based instructional models, large air photos, terrain models, and acetate-overlay map systems designed to demonstrate patterns of correspondence in distributions of geographic features.

Systematic practice was given in these programs to certain prerequisite skills found, in the developmental phase of this research, to be critical in achieving criterion performance on these analytic tasks. These skills included: (1) reading map symbols at levels of increasing abstraction, on maps produced at different scales; (2) reading the map grid, and locating places with reference to coordinates; and, (3) grouping "like" geographic features into a single set, a skill prerequisite to determining patterns of correspondence in distribution of two or more such sets within a region.

Curriculum B was designed to develop children's understanding of selected generalizations from geography. Teaching the content of the social sciences through the study of generalizations is one currently advocated method for improving learning in social studies. Curriculum B drew upon these premises, and used as its content source geographic generalizations from the California State Framework for the Social Studies(4).

For each grade, three generalizations were selected. Each generalization incorporated the concept of areal association in the stated reference each made to relationships of physical and cultural factors in man's use of the landscape. This curriculum differed from Curriculum A by giving children examples of these generalizations in the form of a number of simple geographic relationships from which the more broadly stated generalizations could be inferred. Curriculum B did not give practice in the analytic processes by which geographers study the data of the landscape and determine relationships between features within it.

Curriculum B, like Curriculum A, centered first grade instruction in the neighborhood and its relationships with the wider community; second grade instruction in comparative studies of the extended urban-industrial complex; and third grade instruction in historical antecedents of the local community. These programs incorporated the use of new maps, terrain models, films, self-instructional materials, and field trips.

Both Curriculums A and B were developed over a sixteen-week period, with fifty minutes per day devoted to instruction. Each program was developed within the time of the normally scheduled social studies lesson.

Teachers in both curricula perceived their programs as new, experimental ones, designed to improve instruction in geography. All had expressed interest in becoming part of the project. Both groups, after assignment, received special instruction, through separate, intensive summer workshops, and through continuing weekly "in-service" meetings with the Project Director, regarding the nature of their separate programs. Both received new instructional materials, relevant to their assignments, and both realized the continuing interest of the school district and project personnel in these programs throughout the experimental period.

Dependent Variable

The dependent variable in this research was children's achievement in geography, at each of three levels of cognitive operations. Achievement was differentiated, after Bloom's Taxonomy of Educational Objectives(1), to include the following three levels of cognitive performance: (1) knowledge of geographic features and functions; (2) comprehension of the concept of areal association, the core concept of geographic theory; and, (3) ability to apply the concept of areal association in regional analyses of unfamiliar environmental complexes.

Hypotheses

The major hypotheses of this research were the following:[1]

(1) No significant difference will be found between groups enrolled in Curriculums A and B on criterion scales measuring knowledge of geographic terms, that is, of geographic features and functions.

(2) Subjects enrolled in Curriculum A will evidence significantly higher achievement, at all three grades, on criterion scales measuring comprehension (understanding) of the core concept of geographic theory.

(3) No significant difference will be found between groups enrolled in Curriculums A and B on criterion scales measuring ability to apply that concept appropriately in interpreting the data of unfamiliar geographic regions.

The null hypothesis was to be rejected at the .05 level of significance.

Method

The Sample

The population was elementary school children of first, second, and third grade classes in large, public metropolitan elementary schools of Los Angeles County. From the pool of elementary schools interested in participating in this project, final selection was made of those representative of the distribution of socioeconomic characteristics within the county.

Teachers were solicited through building principals and school supervisors. To control for systematic differences between groups on teaching variables other than the critical treatment factor, teachers were first selected on criteria of teacher-effectiveness and interest in participating in the project, and then randomly assigned to each of the two experimental programs. Assignments were completed five months prior to the experimental period, to allow time for summer training workshops, delivery of materials, and pretesting of children.

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[1]Hypotheses were also formulated for the smaller experimental researches conducted within the context of the larger research program. See Chapters 5 and 6 of this report.

Subjects were children regularly enrolled in 4 intact, graded classrooms at each of three grades, first, second, and third. The 12 intact classes served as the sampling units, and were randomly assigned, at each grade level, to each of the two instructional programs.

Procedures

Procedures included (1) a one and a half year developmental period when the two curricula, their instructional materials, and the criterion instruments were developed and refined; and (2) a one-year experimental period when the two curricula were introduced in 12 intact classrooms.

Criterion instruments developed for this research measured three levels of geographic thinking, at each of three levels of symbolic difficulty. Criterion scales developed for grades 1, 2, and 3 included therefore, pictorial items, symbolic items, and air photo items for each of three geographic operations: (1) knowledge of geographic features and functions; (2) comprehension of the concept of areal association; and (3) application of the concept in regional analyses.

The research design employed in this study involved the pre- and post-administration of the criterion instruments. Trained research assistants administered the tests to children, individually in grades one and two, and to small groups in grade three. Enrollments differed in the 12 classrooms. Class means served as the experimental units, and were weighted equally in all data analyses. Pretest scores were used as covariance controls. Analysis of variance was applied to the adjusted criterion measures, and an F-test used to test the significance of the treatment differences.

Findings

Results in Knowledge of Geographic Features and Functions

It was hypothesized that no significant difference would obtain between groups in subjects' knowledge of geographic features and functions. Both curricula, it was anticipated, would prove effective in familiarizing children with natural and cultural features of the geographic landscape, and with their geographic functions.

The hypothesis was supported in grades 1 and 3. Subjects, at those grade levels, achieved mean scores under the two experimental curricula which evidenced no significant between-programs difference. Both programs A and B effected post-test performance significantly above the chance level. In grade 2 a statistically significant between-programs difference was obtained ($P < .05$). In grade 2, the null hypothesis was therefore rejected. Subjects in Curriculum A achieved significantly higher mean scores than did those enrolled in Curriculum B.

Results in Comprehension of the Concept of Areal Association

It was hypothesized that subjects enrolled in Curriculum A would evidence significantly higher mean achievement on post-test measures of comprehension of the concept of areal association than would subjects in Curriculum B.

The between-programs difference in Grade 1, while in the predicted direction, failed to reach statistical significance ($F = 15.357$). First grade subjects instructed in a program designed to give practice in analyzing patterns of areal association did not achieve significantly higher mean achievement in comprehension of the concept than did subjects instructed in Curriculum B, the generalizations-centered curriculum. In grades 2 and 3 significant between-programs differences did appear ($P < .05$). In both grades 2 and 3, subjects given practice in analyzing spatial patterns of areal association demonstrated significantly higher mean achievement on a test measuring comprehension of the concept than did subjects enrolled in Curriculum B.

Results in Ability to Apply the Concept of Areal Association in Regional Analyses

The third hypothesis of this research was in the null form, and stated no significant between-programs difference would obtain in subjects' mean performance in ability to apply the concept of areal association in interpreting the data of unfamiliar geographic regions. The difference between first-grade subjects' post-test mean achievement under programs A and B was not statistically significant, and the null hypothesis, therefore, was not rejected.

In grades 2 and 3, between-programs differences each reached significance ($P < .05$). Under Curriculum A second and third grade subjects evidenced a significantly higher mean achievement in ability to apply the concept of areal association in analyzing unfamiliar geographic regions. The advantage for Curriculum A with respect to this geographic operation was not obtained, however, with first grade subjects in this research.

Discussion

In analyzing outcomes of this research, certain limitations on interpretations which can be drawn from these data were pointed out. This was one experimentally conducted research concerning effects of two social studies curricula on children's concept learning in geography. The sample, while representative of socioeconomic levels of Los Angeles County, was relatively small. Twelve classrooms constituted the sampling units.

The possibility of uncontrolled factors in classroom research was of course present. Teachers involved in this research were selected by curriculum supervisors as a group of outstanding, experienced primary teachers, and were randomly assigned to programs after they had expressed interest in participating in a project in geographic education. Teachers under both programs were enrolled in separate summer session workshops to prepare them for the programs they were to teach. Throughout the experimental period, teachers regularly attended institute sessions which carried credit for professional advancement within their school district, and which were designed to facilitate the week-by-week development of these separate programs.

Results of this research are most interesting when analyzed by grade level. Predicted between-programs differences in children's comprehension of the concept of areal association were achieved in grade 1, but did not reach statistical significance. "No difference" results such as these are always difficult to interpret. It is possible, for example, that the small sample was a factor in these findings. Since in grades 2 and 3, where significant between-programs differences were obtained, a similar sample size was employed, it is important to consider other factors, as well.

Areal association is a concept requiring the ability to engage in relational thinking concerning the distribution and patterns of association of geographic features in the landscape. While numbers of researchers have found relational thinking developed in the "concrete operations" of the early elementary school years, considerable variability is reported in the age of onset of particular thinking operations. Analyses of effects of these curricula with subjects differentiated by intelligence would be useful in this regard. Follow-up studies with considerably larger samples would also be recommended.

In the geographic subject matter of grades two and three, statistically significant between-programs differences were obtained in children's understanding of and ability to apply the concept of areal association. Higher achievement was obtained, in the case of both operations, under Curriculum A. Children in grades two and three responded to a systematic program of instruction in geography, and evidenced significant increments in their ability to engage in two tasks of relational thinking in geography.

Concerning these findings, certain limitations and directions for continued research should be noted. This study employed two curriculums of 16 weeks duration, only. What the effects might have been, had instruction been continued for one school year cannot be estimated from this research. Particularly important, subjects in Curriculums A and B, both, were introduced to new instructional programs. What might be the result at the second and third grade levels, were children engaged in a consistent, three-year curriculum under the arrangements of programs A and B cannot, again, be determined from these data.

One of the more important, newer emphases in school curriculum development is the effort to develop articulated programs for continuous concept-learning. The sequence of experimental curriculums developed for this research is premised on the curriculum principle of continuity in concept-learning. In the experimental stage of this research, however, no test was possible of the cumulative effects to be obtained over three-years' time under either Curriculum A or B. Subjects enrolled in the second and third year curriculums were without benefit of antecedent instruction in the particular curriculum in which they were enrolled. Continued study, therefore, is essential if the long-term effects of these programs are to be known.

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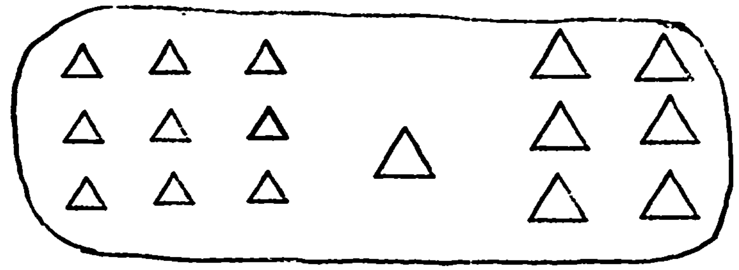
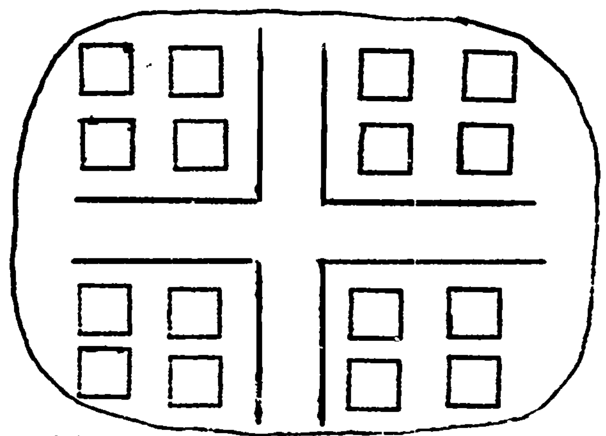
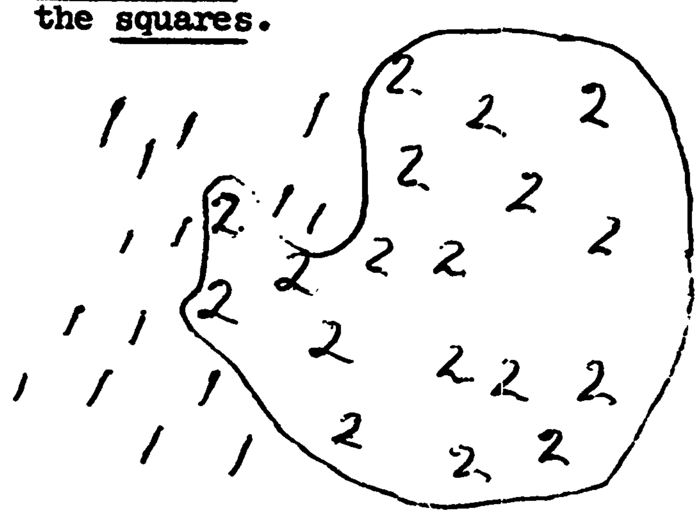
APPENDIX A

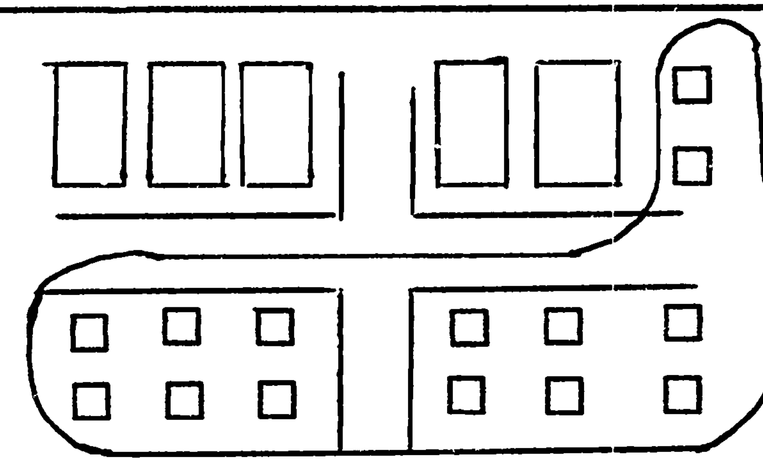
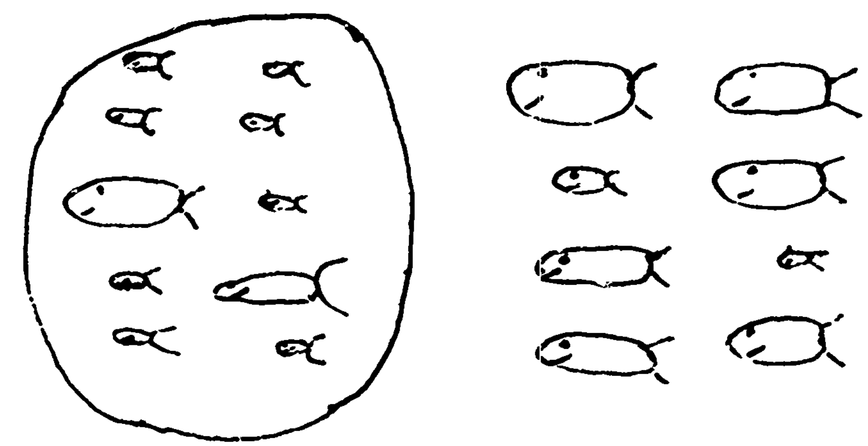
Defining Attributes of Geographic Class-Concepts and their Identification on Air Photos

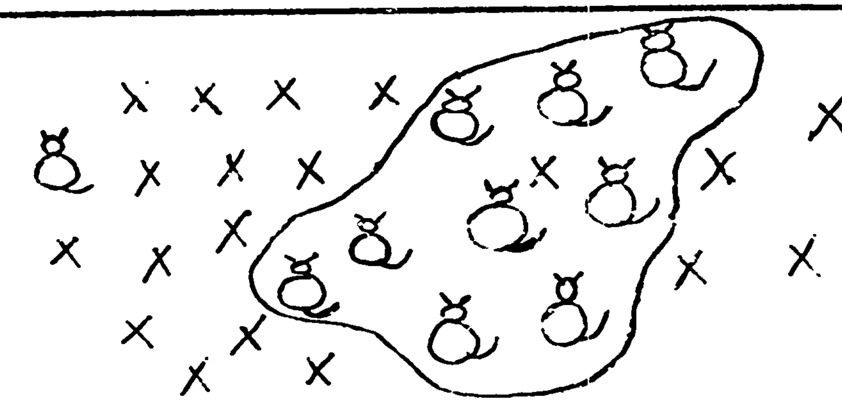
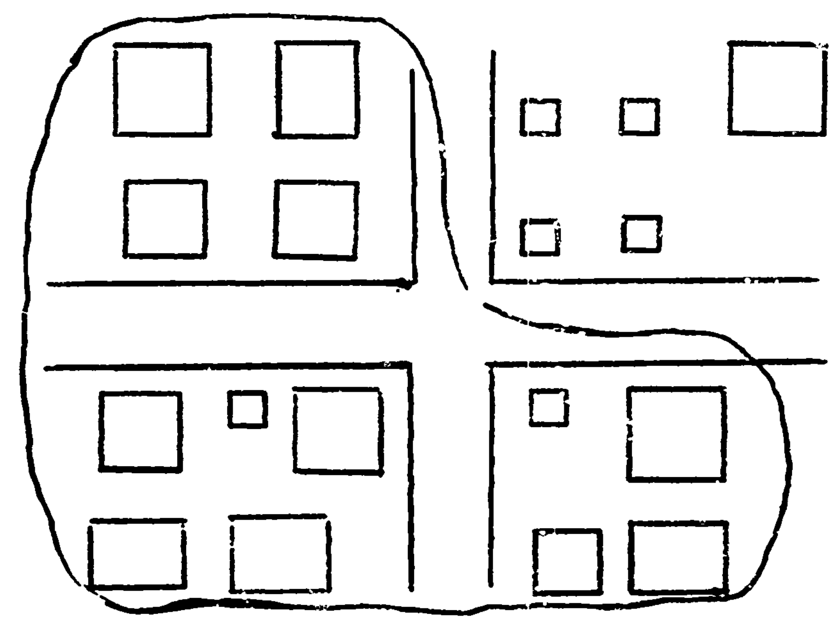
Defining Attributes of the Concept	Differentiating Cues of the Air Photo: Form and Shadow	Tone and Texture	Pattern
Commercial: Larger structures, located along major arteries and their intersections, often with adjacent parking areas; set close to curbing; usually in pattern of intensive land use with minimum of planting.	Broad, flat roofs, rectangular form.	Generally sharp, Light tone (roof surfaces, contrasting with streets and parking surfaces).	Proximate, often regular placement of roof surfaces; pattern of intensive land use.
Residential: Single family: Smaller structures, located along second and third order streets back from curbing, with plants often front and rear.	Smaller roofs,	Generally mottled tone, indicating contrast in areas with dark vegetation and light rooftops.	Relatively open land use.
Residential, Multiple family: Larger structures along first and second order streets;	Broad flat roofs, rectangular form.	Generally sharp, light tone. Minimum of mottled effect.	Proximate, often regularly placed in pattern of intensive land use.
Clusters of smaller units occupying single lots along second and third order streets.	Smaller roofs, often in open squares, or set front and back on lots.	Contrasting sharp light tone of roofs and mottled effects of vegetation.	Pattern of intensive land use, varying as indicated in column 2.
Central Business District: High-rise structures, set in pattern of intensive land use, on first and second order streets.	Shadows indicating tall structures, broad roofs.	Generally sharp, light tone.	Intensive land use, regular placement, with parking lots ancillary to core area.

APPENDIX B

Instructional Sequence in Set Discrimination and Grouping

Instructional Series	Criterion Behavior	Sample Items
I. Grouping Like Sets Item Series 1 - 2	Ability to group a like set, disregarding the spatial pattern of its members	 2. Directions: Draw a line around all the triangles.
Item Series 3 - 5	Ability to group a like set, enclosing all like members and disregarding as irrelevant lines and spaces within the pattern.	 5. Directions: Draw a line around all the squares.
Item Series 6 - 8	Ability to group an extended like set, enclosing all members contiguously located in space.	 8. Directions: Draw a line around all the 2's.

	Criterion Behavior	Sample Items
Item Series 9 - 12	Ability to group an extended like set, enclosing all members contiguously located in space; and, disregarding as irrelevant lines and spaces within the pattern.	 12. <u>Directions</u>: Draw a line around all the <u>small squares</u>.
II. <u>Grouping Mixed Sets</u> (defined by majority members) Item Series 13 - 14	Ability to group a mixed set, defined in terms of its majority members.	 14. <u>Directions</u>: Draw a line around the group that is mostly small fish.

Item Series 15 - 16	Ability to group an extended mixed set, defined in terms of its majority members contiguously located in space.	 15. **Directions:** Draw a line to make a <u>large group</u> that is mostly cats.
Item Series 17 - 20	Ability to group an extended mixed set, defined in terms of its majority members, contiguously located in space, and disregarding as irrelevant lines and spaces within the pattern.	 19. **Directions:** Draw a line to make a <u>large group</u> that is mostly big squares.

APPENDIX C

EXPERIMENTAL CURRICULUM A
Grades 1 and 2

I. MAJOR ORGANIZING CENTER: INQUIRY INTO CHILDREN'S RESIDENTIAL NEIGHBORHOOD

A. INSTRUCTIONAL OBJECTIVES FOR ORGANIZING CENTER I

Children will be able to differentiate between types of residences.
- Single-family (houses, trailers)
- Many-family (duplex, apartments)

Children will recognize differences in age of residences.
- Older residences
  - (California bungalow, Spanish style house or apartment)
- Newer residences
  - ("Modern" apartment; ranch-style house)
- Temporary residences: trailers, tents

Children will be able to identify a street as primarily a pattern of:
- Single-family houses
- Many-family apartments
- Mixed (houses and apartments)
- Change (older houses + vacant lots + new apartments)

Children will demonstrate understanding of the word <u>residential</u> by applying it to describe neighborhoods of homes and apartments.

Children will demonstrate understanding their neighborhood is undergoing change in land use. For example:

(1) older houses are being moved

(2) new apartments are being built

(3) additional housing is being constructed on lots and over garages
(McKinley School only)

Children will be able to anticipate consequences in a residential neighborhood when new apartment houses are built. For example:

(1) more people will probably come into this neighborhood to live

(2) traffic will increase

(3) parking problems will increase

Children will comprehend a relationship between new apartment construction and job opportunities. For example:

(1) when a new house or apartment is built there are jobs for many workers: plasterers, plumbers, painters, masons, etc. (those jobs studied in relation to construction observed).

Children will comprehend a relationship between new apartment construction and utilities. For example:

(1) when a new house or apartment is built, telephone lines are brought in.

(2) when a new house or apartment is built, pipes are laid.

(3) when a new house or apartment is built, electricity is brought in.

Children will be able to use pictorial symbols representing single and multiple-family dwellings.

Children will be able to locate and name the major streets bordering the school.

Children will be able to differentiate these streets by volume of traffic (busy, and not busy); and, by numbers of traffic lanes.

Children will locate north, south, east, and west on the neighborhood maps when laid out on the floor, and properly labeled.

Children will be able to use the map by tracing routes between the school and designated homes, as directed by the teacher orally.

I. MAJOR ORGANIZING CENTER: RESIDENTIAL NEIGHBORHOOD (Continued)

B. LEARNING OPPORTUNITIES

Obtaining Information on Population Within the Local Neighborhood

Considering how families have come from many different places to live together in this neighborhood.

Counting how many children in the classroom were born in this community.

Counting how many have arrived here in recent months.

Finding out how many might have come from other countries.

Discussing some of the reasons families come to this community to live.

Job opportunities for fathers and mothers.

An attractive climate with good recreational facilities.

A variety of housing accommodations.

Good schools for children.

Relatives already in the neighborhood.

Summarizing some of the things families can do because they live in this place:

Go to the beach.
Go to the mountains.
Work at certain jobs.
Play in a number of parks, school playgrounds.
Shop in certain kinds of stores.

Comparing these activities with different activities available in other places children have lived.

Deciding that the place families live does influence the ways in which they live; that place is important.

<u>Finding Out About Homes Within This Neighborhood</u>

Inquiring why families need homes.

Discussing homes as places of shelter, places to live, play, and work together, places to take care of personal needs, and to provide for the needs of children growing up.

Discussing "functional similarities" in homes, in their provision for:

A place to sleep
A place to store, prepare, and serve food
A place to spend time together
A place to care for personal needs

Inquiring into ways this neighborhood is providing homes for many new families.

Taking a field trip in the immediate neighborhood to observe homes and apartments.

Preplanning the field walk in two stages: one to the area north of Montana Avenue (Primarily single family homes); and a second to the area south of Montana Avenue (a neighborhood in transition).

Discovering that families in this neighborhood live in different kinds of homes.

Single-family dwellings (Alta to Idaho)

Frame house
California bungalow
Spanish bungalow
California cottage
Spanish-style house
Monterey-style house

Multiple-family dwellings (Montana to Washington)

Spanish-style apartment
Georgian-style apartment
"Modern" apartment

Locating these places on a simple picture map prepared for the field walk, and placed on the sidewalk, properly oriented north and south.

Noting the contrasts between older single-family dwellings and newly constructed apartments in this region.

Noting construction underway. Visiting a construction site to observe activities and materials used.

Noting provisions made for parking autos in the new apartment complexes (basement garages, and parking lot adjoining the church).

Estimating intensity of land use by contrasting these structures either as "one family" or "many family" dwellings.

Deciding the newer structures are all "many family" dwellings.

Observing vacant lots, where houses have been razed.

Hypothesizing as to the future use of these lots (for apartment construction).

Drawing a conclusion concerning this neighborhood: for example, a place that is growing rapidly, with changing patterns in land-use and population density.

<u>Developing the regional model</u>

Reconstructing the field trip through the use of large-scale models in the classroom.

Locating on the "land-base model" Roosevelt School, Montana Avenue, the cross-walk, and Lincoln Boulevard.

Referring to data concerning the structures seen along the way, and placing models, representing those structures, on the land-base.

Moving model automobiles and people along Lincoln Boulevard between: (1) the school and the parking lot: (2) the church and the crossing signal at Montana Avenue.

Learning the term "residential" to describe this street as predominantly a street of homes and apartments.

C. TRANSITION

Children, in developing the large-scale neighborhood models, can be engaged in dramatic play. They will recognize that "families" in this neighborhood need the resources and services of suppliers.

Children can be engaged in listing the kinds of goods and services their residential neighborhood needs. Charts, for example, can be developed which list these goods and services under a classification system children help to develop.

Inquiry can then be raised concerning where all these goods and services come from. Many will be obtained from the neighborhood commercial center. Others will require the services of specialists located in the Central Business District and the industrial region of the city. Examples should be taken from children's experiences. Children should be helped to realize their residential neighborhood is functionally linked to other places, in terms of the goods and services obtained there.

Since the most immediate of families' needs are often supplied in the local commercial center, and it is the simplest, geographically, to examine, it is this region which is next studied in this curriculum.

II. MAJOR ORGANIZING CENTER: INQUIRY INTO THE NEIGHBORHOOD COMMERCIAL CENTER

A. INSTRUCTIONAL OBJECTIVES

Children will differentiate between second and third degree arteries. For example:

> Montana Avenue is a busy street, carries truck and bus traffic, and has four lanes.
>
> Ninth Street and Washington Avenue are residential streets, have two lanes, are relatively free of traffic, and are used chiefly by automobiles.

Children will classify structures observed in the neighborhood commercial district as different from residential structures, on criteria of size and function.

Children will define a relationship between the residential neighborhood and its neighborhood commercial center.

Children will define a relationship (accordant) between the commercial center and the secondary artery with its cross-streets where businesses are located.

Children will predict possible consequences in change of any one of these features on other features in the residential-commercial neighborhood complex. For example:

> A new bank will "draw" other businesses.
>
> New apartment construction will "draw" a big new supermarket.

Children will be able to project linear routes on maps of the known region.

Children will be able to project streets, as a grid system, in developing a map of the known region.

Children will differentiate known features on a large air photo of the familiar region, and classify them as "residential" or "commercial."

Children will be able to identify "pattern" in the geographic landscape by (a) identifying the visual cues of residential and commercial regions on an air photo; and (2) circling "like" features as "residential" and "commercial" regions.

Children will apply the concept of areal association by proposing good new locations for specific features (a supermarket, for example) in changing and hypothetical neighborhoods.

II. MAJOR ORGANIZING CENTER: NEIGHBORHOOD COMMERCIAL CENTER (Continued)

B. LEARNING OPPORTUNITIES

Obtaining Information on the Neighborhood Commercial Center: Its Features and their Functions

Taking a field trip to the neighborhood shopping center (the Montana Center) to identify goods and services immediately available in the neighborhood.

Locating this center on Montana Avenue, between Seventh and Ninth Streets.

Planning a walk to examine the stores located between Ninth Street and Lincoln Boulevard: two doctors' offices, a bank, and a supermarket.

Noting that the bank and supermarket are new, artistically designed, and dominate this shopping center. (Establish its "character" as an improving neighborhood center, serving a wider clientele.)

Planning a behind-the-scenes visit to the new supermarket, to learn the functions carried on in this center.

Identifying the services of the supermarket:

Meat section
Dairy case
Frozen foods
Fresh vegetables and fruits
Canned and bottled goods
Breads and packaged bakery goods
Household wares, clothing
Bakery
Delicatessen
Magazines, records, and books
Florist

Locating the stockrooms, produce elevator, delivery ramps, offices, and parking areas.

Learning of the specialized workers: the manager, stock clerks, delivery men, checkers, box boys, etc.

Learning the functions of the "chain store," with its central wholesale facilities, supplying many supermarkets throughout the city.

Returning to the classroom and preparing picture maps of the supermarket to locate its functionally differentiated areas.

Using classroom resources, and the recall of personal experiences, to determine the functions of the two doctors' offices.

Hypothesizing why these facilities are all located together within a single block on Montana Avenue. Suggesting, for example:

This location is accessible to the families living in this immediate residential neighborhood.

This location on a busy through-street brings arterial traffic to the shopping center. (increases trade)

This location, within a rapidly growing neighborhood of new apartments on each of the streets intersecting Montana Avenue, brings potential new customers to these businesses.

Taking a second field trip, to identify businesses, and their functions, in the area between Seventh Street and Lincoln Boulevard.

Identifying the consumer goods and services available here:

Automotive services: three service stations, providing auto repair.

Food services: a grocery store, two restaurants, a bakery.

Clothing stores: two dress shops, a jewelry store.

Laundry and cleaning establishments.

Druggists

Real estate office

Finding out about the specialized functions of these places:

Gasoline Station

Visiting a service station and locating:
- Pumps, for gasoline
- Grease rack, for servicing cars
- Garage
- Water hose
- Air hose
- Office

Learning that:
- Meters are set up by an oil company
- Gasoline is stored underground, in tanks
- Gasoline is delivered in gasoline tank trucks, from company suppliers
- Gasoline comes in different grades: Regular, High Octane
- Cars are lubricated on grease racks, with a hoist for elevating cars
- Mechanics are trained for servicing cars
- Automotive supplies, oil and tires are sold

Bakery

Learning what services are available here:
Baking of cakes, pies, breads, pastries.

Learning about the workers in a small bakery:
Manager or owner, bakers, sales people.

Learning about the suppliers to the baker:
Delivery trucks bringing flour, eggs, baking powder, sugar, milk and butter.

Drug Stores

Visiting a neighborhood drug store.

Discussing the variety of goods and services available here:
Drugs, household products, paper products, cosmetics, newspapers and magazines, candies, etc.

Learning who works in a drug store:
Manager, pharmacists, sales people

Laundry and Cleaners

Comparing the different laundry and dry cleaning services available in this neighborhood: drive-in service, "do-it-yourself" laundromat, professional laundry and cleaning services.

Discussing why neighborhoods support laundry and cleaning establishments.

Real Estate Office

Discussing the functions of a real estate office: the listing and sales of properties in the neighborhood (and beyond).

Noting that real estate offices are located on the main boulevard (Montana Avenue) to attract commuters as customers.

Noticing that one building is vacant and another has just changed occupants.

Learning that a laundry has just moved out, and a new druggist renovated that building; that a second druggist has expanded into larger quarters across the street; and that the Shell Service Station has just been completely rebuilt and enlarged.

Raising inquiry concerning all these changes: why do some businesses leave and other expand?

Learning that customers in this neighborhood make choices as to which stores they patronize, and that the choices customers make (what they purchase) help determine whether a local business expands or closes.

Learning that families' income in a neighborhood influences the kinds of businesses that develop there. Learning that what families choose is in part a matter of what they can afford to buy. Noting that food, drugs--and, for car-owners, gasoline--are considered essentials by most families. In this neighborhood, with its high employment level, these are all three expanding businesses.

Learning that location also is a factor; that the Shell Service Station, for example, is located at the intersection of two busy arteries, and benefits from its accessibility.

Learning that a successful, growing neighborhood commercial center attracts new businesses. That people are drawn into the area for one kind of service will often shop there for others, too (foot traffic concept).

Summarizing the goods and services available in this center. Comparing with their original list of goods and services families consume, to see which of those originally listed are not available in the neighborhood.

Developing a land-base model of this region.

Locating on their masonite boards the arteries and their intersections identified on the two field-walks.

Adding three-dimensional facilities and structures to the neighborhood model, to simulate this neighborhood.

Learning the term commercial to describe these two blocks. Deciding the services of this neighborhood commercial center are primarily domestic, providing for immediate family needs. (Food, drugs, doctor's care, auto servicing, banking, and laundry.)

Studying the entire land-base model now as a "residential-commercial complex" (that is, a residential area together with its neighborhood commercial center.)

Recalling that new families are moving into this residential neighborhood, and that new apartments are being constructed to provide for their housing.

Noting that the commercial center is changing too: a new supermarket (Safeway) and a new bank (both "firsts" on Montana Avenue) are under construction in this immediate neighborhood, an enlarged parking lot has been provided, and a new drug store has been added.

Summarizing the relationship between a residential area and its neighborhood commercial center.

Developing maps of this region.

Extending map-reading skills: IA. Linear relationships

Moving vehicles (model autos) or dolls along the land-base model of Montana Avenue to establish linear relationships between: (1) the school and gas station;

(2) the school and drug store; (3) the market and bakery; and, (4) the bank and dry cleaners.

Developing map-practice sheets requiring mapping of these and other linear relationships.

Extending map-reading skills: IB. Coordinate relationships.

Moving model autos or dolls on the land-use model.

Constructing a system of coordinate relationships by mapping routes: (1) from school to the gas station; (2) from school to the church; (3) from school to the drug store; (4) from the drug store to the "blue house"; (5) from school to the "red house"; (6) from the "red house" to the "blue house."

Studying the acetate-overlay program I, to observe how these routes look when superimposed upon a map of the region.

Practicing skills in reading map coordinates by use of follow-up map practice sheets.

<u>Reading air-photos of this and comparative regions and drawing interpretations</u>.

Studying an air photograph of this region to see how residential and commercial zones can be identified.

Discovering that trees, streets, roof patterns and building density can serve as "indicators" of land-use.

Identifying residential areas by trees and by buildings set back from the street.

Identifying the commercial zone along Montana Avenue by its relatively large, flat-topped buildings, set immediately up to the sidewalk.

Discovering apartment-houses are more difficult to distinguish from the commercial area than are the single-family dwellings.

Locating on the air photo other nearby "neighborhood commercial centers" which families individually are patronizing.

The 14th and Wilshire center
The San Vicente-26th Street center
The 14th and Montana center

Inquiring briefly into services and goods available at each.

Noting, through viewing film-strips, some basic similarities common to all these neighborhood commercial centers.

Inquiring into differences in the "character" of these centers.

Deciding the banks, loan companies, theater, clothing stores, and the large supermarket distinguish 14th and Wilshire as a busy and heavily patronized center.

Noting the large parking lots on the aerial photo.

Contrasting this center with the growing, but smaller, Montana center.

Considering the importance of Wilshire Boulevard as a "through street"--a critical factor in the development of that center.

Discovering how residential and commercial zones "pattern" in Santa Monica.

Placing sheets of clear acetate over the aerial photo.

Classifying and then encircling residential and commercial areas with use of colored china markers.

Demonstrating understanding of the concept of <u>areal association</u>.

Using maps of hypothetical regions.

Locating a "good place" for a <u>new</u> apartment, a house, a gasoline station, a market, etc., on the map.

Classifying each feature as "residential," neighborhood commercial, or arterial.

Selecting appropriate location for each.

<u>Developing dramatic play experiences using their extended residential-commercial neighborhood centers.</u>

Incorporating activities of supermarkets, suppliers, banking and real estate transactions, trucking, and so forth.

Adding to the regional models features for traffic control, communication, and so on, as children's interests and the region itself requires.

C. <u>TRANSITION</u>

Transition to a study of the Central Business District can be made by helping children recall that many of the goods and services their families need are not supplied in these local neighborhood centers. Children's shoes and household furniture, for example, cannot be bought here. Children might suggest their parents have to shop "downtown" for these things. They might also suggest they should add that place to their regional models, so they can carry on these wider activities.

III. MAJOR ORGANIZING CENTER: INQUIRY INTO THE CENTRAL BUSINESS DISTRICT

A. INSTRUCTIONAL OBJECTIVES

In a field trip to the Central Business District, the children will:

Identify the route taken from school to the CBD.

Identify the major traffic arteries in the CBD.

Identify major business establishments and their functions in the core area (the mall).

Clothing stores
Jewelry stores
Opticians

Identify major business establishments on Fourth Street.

Banks
Large furniture stores
Department store
Parking lots

Identify structures and their functions on Ocean Avenue.

Hotels
Apartment hotels
Restaurants

In a field trip to the Central Business District, children can:

Identify this region as a commercial zone.

Differentiate between regions within the CBD. For example, the core area and the secondary area might be differentiated by observing and classifying the specific stores distinguishing each.

On Third Street (the mall) the stores are mostly clothing, jewelry, and opticians' businesses. These are all high value products, the stores are (comparatively) small, and closely built. (Intensive land use)

On Fourth Street (the secondary area) the stores are larger and there is more open space. These places are large banks, large department and furniture stores, and large parking lots.

Differentiate between the <u>core area</u> and the <u>outlying area</u> by summarizing their observations in the field. For example:

On Ocean Avenue the structures are mainly big hotels and motels.

On Wilshire Boulevard there are gas stations, restaurants, and some big banks and furniture stores.

Both of these streets are different from the core.

Compare the mall and the unchanged portion of Third Street. Identify the mall section as a place which has most recently been changed.

In developing a scale model of the Central Business District, children will:

Identify the major traffic arteries in the Central Business District by labeling those streets on the boards.

Identify major business establishments in the mall by placing their models on Third Street

Identify major business establishments in the secondary area by placing their models on Wilshire Boulevard, on Fourth Street, on Santa Monica Boulevard, on Colorado Avenue, and on Third Street south of the mall.

Identify major hotels by placing their models on Ocean Avenue.

In developing a scale model of the Central Business District, children will:

Identify the features which make this region a commercial zone.

Business establishments
Intensive land use

In using the floor models in dramatic play, children will demonstrate:

Understanding that the Central Business District is the area to which many families come to shop or work.

In examining photos of this region undergoing change, children will observe:

Old railroad tracks were once used here. Tractors pulled them out to make the mall today.

The oldest building in Santa Monica today is located in the Central Business District.

In practicing place locations on the Central Business District model, children will be able to:

Locate intersects of major streets by placing model cars correctly at:

Corner of Third Street and Santa Monica Boulevard. (Crocker Citizens Bank--Tower)

Corner of Third Street and Wilshire Boulevard. (Penney's)

Corner of Third Street and Colorado Avenue. (Sears)

Corner of Colorado Avenue and Ocean Avenue. (the pier)

Corner of Wilshire Boulevard and Ocean Avenue. (Miramar Hotel)

In studying air photos of the Central Business District, children will:

Encircle the Central Business District as a commercial region.

Encircle the mall as the core of the Central Business District.

Group the structures on Fourth Street as a secondary area of the Central Business District.

Group the structures along Ocean Avenue as an outlying section of the Central Business District.

In reading air photos of the Central Business District, children will:

Identify the commercial region by its relatively large structures, set close to street, with a minimum of planting.

Identify the nearby residential area by its pattern of mixed single-family structures and apartment dwellings, vegetation, and smaller (third-order) streets.

Identify the secondary area of the Central Business District by its comparatively more open land use, the parking lots, and commercial structures.

Differentiate between major arteries and the less-traveled third-order streets.

In dramatic play with model layouts of residential neighborhood and the Central Business District, children will demonstrate accurate patterns of movement:

between the residential neighborhood and the stores of the Central Business District

In dramatic play, using a variety of vehicles in the Central Business District area, children will demonstrate accurate patterns of movement on the part of truckers supplying the shops of the Central Business District.

In analysis of acetate overlay instructional programs recording circulation patterns in Santa Monica, chiddren will demonstrate ability to analyse circulation patterns between regions in the city. For example:

Greatest movement into the Central Business District is movement of buyers from residential neighborhoods in Santa Monica.

A second pattern of interrelationships is that between the business in the Central Business District and their suppliers. Delivery trucks bring merchandise, daily, to loading ramps in rear of stores.

III. MAJOR ORGANIZING CENTER: THE CENTRAL BUSINESS DISTRICT (Continued)

B. LEARNING OPPORTUNITIES

Obtaining Information on the Central Business District: Its Facilities, their Distribution, and their Functions.

Recalling the many goods and services families need which ordinarily are not supplied in local neighborhood centers.

Learning that the Central Business District is the largest commercial center in the city, and serves all of Santa Monica's nieghborhoods by providing a wide variety of goods and services.

Preparing for the field study trip.

Locating on the model of the Central Business District a number of key features, later to be observed in the field:

Ocean Avenue, paralleling the coastal strand.

Miramar Hotel, establishing the northernmost features on the model.

Sears, Roebuck and Company, establishing the southernmost feature on the model.

Selected structures in the core or mall: Woolworth's, McMann's Shoes, Penney's Department Store, the Crocker-Citizens Bank and its clock tower.

Taking a field trip to the Central Business District.

Locating the Central Business District in relation to the school.

Discovering that Third Street, intersected at Santa Monica Boulevard, is the core of this district and is the oldest business district in the city.

Learning the pedestrian mall, between Wilshire Boulevard and Broadway on Third Street, has just been completed.

Inquiring as to who built the mall and why.

Hypothesizing reasons: for example, to make shopping easier and safer, to make the city more beautiful, to draw new customers to the Central Business District.

Standing at Third Street and Santa Monica Boulevard, the historic core of the city, and learning the building there is one of the oldest in the city.

Learning that business men operating these stores today made a decision to renovate this region, in the hope of increasing trade and vitalizing the Central Business District as a commercial center.

Viewing photos showing the old rail lines pulled out of this area to permit new surfacing of the mall. Deciding people have changed the appearance of this place.

Walking north toward Wilshire Boulevard, and examining the shops in this central core of the Central Business District.

Counting and recording the number of different stores.

Deciding this is a section catering largely to personal sales: children's shoes, clothing, jewelry, drugs, cameras, and the services of optometrists.

Noting the absence of auto traffic and parking areas; the convenience of benches, trees and fountains for the foot-shoppers in the mall.

Noting building renovation underway, as merchants improve their building fronts and "modernize" the structures.

Deciding these efforts in renovation are related to the construction of the mall and to merchants' desires to bring new business to the area.

Walking east to Fourth Street, for a tour of the "secondary area" of the Central Business District.

Noting the contrast in the "character" of this street: buildings are taller, parking lots frequent, and there is, generally, a greater amount of open space. Particularly striking: heavy traffic, diverted from Third Street.

Deciding this "secondary area" is a section: (1) of large department stores; (2) of stores dealing in heavier and bulky household furnishings and appliances; and, (3) of the large banking firms and loan companies.

Inquiring why the core area and the secondary area differ.

Comparing the buildings.

Learning that services carried on in the secondary area require more floor and storage space. These companies use the less expensive area surrounding the core of the district so they can afford the floor space they need.

Finding out about the large department stores in the Central Business District.

Visiting a department store.

Discussing the many specialized departments offering goods and services to customers:

Clothing, shoes, toiletries, jewelry
Household furnishing and appliances
Kitchen wares, china, silver, and linens
Bedding, draperies, towels, carpeting
Beautician, car servicing, insurance travel tickets
Toys and gifts, garden supplies, tools, hardware
Credit department and accounting

Finding out about the banks, and the services they provide.

Inquiring why banks are important services in the community.

Visiting a bank. Learning that banks have places where customers can deposit and withdraw funds (tellers window); places for safekeeping of valuables (safety deposit boxes); desks for negotiating loans, escrow, and other personal transactions; statement windows where customers obtain information concerning their accounts; and merchants' windows for handling business accounts.

Learning that banks are places for investing money. Families place their savings in banks, both in commercial and in savings accounts. Comparing the two kinds of accounts.

Learning that banks are places for lending money. Banks lend these savings to other people and to companies, and make a profit for themselves and their customers in doing so.

Learning that new businesses in the community grow because owners can borrow money from the bank, and then later repay what they borrowed with "interest."

Concluding the field-study tour with a bus ride through the surrounding (tertiary) area of the Central Business District.

Driving along Colorado Avenue to Ocean Avenue, north to Wilshire Boulevard, and thence to school.

Discovering these outer limits of the Central Business District differ from the inner core and from the secondary (financial) area.

Observing large hotels, motels, and apartment hotels on Ocean Avenue.

Learning about the special accommodations provided: rooms for guests; dining areas; lounges; shopping centers, including drugs, newsstands, gifts, flowers, ticket agencies, airline offices; accommodations desks.

Learning about services provided: maid and valet services; room service, elevator service; cleaning and pressing; bell-hops; taxi and limousine; entertainment.

Comparing hotel and apartment accomodations. Deciding the ocean view makes this region a desirable residential and tourist area, and accounts for the concentration of high-value, high-rise new hotels and apartments under construction or newly completed here.

Observing restaurants, service stations, and real estate offices on Wilshire Boulevard.

Recalling Wilshire Boulevard is a busy street, with much traffic, and serves many people passing by, as well as families in the nearby residential areas.

Recalling the term arterial commerce for commercial regions such as those along Wilshire Boulevard and Santa Monica Boulevard--streets which are "through streets" and carry heavy traffic into Los Angeles.

Observing, on the return ride, the areas of transition between the Central Business District and its surrounding residential neighborhoods. Noticing where older houses, on the fringes of the Central Business District, have been converted to commercial use (key shops, e.g.). Learning these are areas changing in their functions.

Developing a Land-Base Model of the Central Business District.

Recalling, with the aid of film-strips of the region, the nature of the core district.

Locating, on the base-model, Third Street, and the major cross-streets within this core region.

Locating, on the model, structures representing businesses in the core district.

Adding to the model trees, benches, and fountains to complete the mall.

Developing the secondary area of the Central Business District.

Identifying major streets and their intersections.

Adding key structures (banks, finance centers, furniture stores, and department stores).

Developing the outlying or tertiary area of the Central Business District by adding to the model:

Hotels and apartments on Ocean Avenue

Key structures on Wilshire Boulevard

Shops in the changing, transitional areas to the south and east of the Central Business District

Extending spatial relationships and mapping skills:

Moving model autos on the land-base model.

Constructing a system of spatial coordinates by mapping those same routes.

Practicing mapping skills by use of follow-up practice sheets.

<u>Studying Air Photos of the Central Business District, and Drawing Interpretations</u>.

Studying an enlarged air photo of Santa Monica to locate the Central Business District and its environs.

Using a paper "frame" to delimit the Central Business District on the larger air photo.

Tracing the major arteries disecting this region to obtain information concerning the accessibility of the Central Business District to all regions of Santa Monica.

Applying skills in air photo analysis to the delineation of regions.

Recognizing the cues differentiating the Central Business District and the nearby residential regions.

Encircling all of the Central Business District with red acetate marking crayons.

Encircling the bordering residential regions with green acetate marking crayons.

Projecting patterns of circulation between these regions, and delineating with brown acetate marking crayons.

Comparing their hypothesized routes with data the teacher presents, based on major bus routes and prime-hour traffic on the more heavily traveled arteries (Wilshire Boulevard, Santa Monica Boulevard, Olympic Boulevard, Fourth Street).

Learning the nearly completed Santa Monica freeway is anticipated to bring additional traffic into this center.

Recalling from personal family experiences the problems of traffic congestion in the Los Angeles area.

Learning from information the teacher supplies, that multi-level parking structures are planned, to accommodate the anticipated increase in traffic.

Learning, from a recent statement of the City Council, some intended plans to convert streets to one-way traffic.

Learning of some of the suggested new routes for a north-south freeway through Santa Monica, or along its ocean frontage.

Deciding these decisions would change Santa Monica--and that people individually feel differently about these various proposals.

Anticipating some of the effects these changes would make in their own lives--what would they do differently, e.g., if a major freeway were built on Eleventh Street (two blocks west of the school), as proposed?

Raising inquiry concerning the effects of traffic on land-use in Santa Monica: What will Santa Monica have to do if all this traffic is to move through the city?

Checking their suggestions against data the teacher provides.

Observing on the air photo, e.g., how parking lots on Second and Fourth Streets are designed to accommodate present traffic into the area.

IV. MAJOR ORGANIZING CENTER: INQUIRY INTO TRANSPORTATION SYSTEMS

A. INSTRUCTIONAL OBJECTIVES

Children will be able to classify commercial transport vehicles by function and by type.

Children will recognize on a regional map, the major transportation arteries of a community by the following differentiating features: number of traffic lanes; through access into surrounding communities; and in case of railroading, tracks and sidings.

Children will demonstrate understanding of patterns of areal relationship in the transportation system of the city. For example:

> Cargo brought into the city by rail is unloaded and then distributed by trucks.
>
> Warehouses, railroad sidings and truck depots are required for the handling of cargo exchange.

Children will be able to apply the concept of "areal association" in determining what factors "associate" in the location and development of major traffic arteries in Santa Monica.

IV. MAJOR ORGANIZING CENTER: INQUIRY INTO TRANSPORTATION SYSTEMS

B. LEARNING OPPORTUNITIES

Inquiring how needed goods reach the stores of the commercial districts.

Recalling the truck-loading platforms at the major stores, for trucks bringing goods into the commercial center.

Viewing photos of warehouse operations, with trucks loading, and box cars on the railroad sidings being unloaded.

Inquiring whether trains as well as trucks bring goods into Santa Monica.

Studying a simple map of Santa Monica to locate some major arteries into the city.

Identifying major arteries on the map, by the number of lanes of traffic: (Olympic Boulevard, Santa Monica Boulevard, and Wilshire Boulevard, e.g.).

Identifying the railroad tracks entering Santa Monica near Centinella and Olympic Boulevards.

Identifying the route of the unfinished freeway, paralleling the railroad tracks and Olympic Boulevard for a part of the way.

Suggesting possible ways goods can be brought into this city. (For example: by truck over major boulevards and freeways; by rail.)

Using documentary sources to obtain information on railroading functions in Santa Monica.

Studying photos taken at the railroad sidings in Santa Monica.

Determining, from these photos, what cargo is brought in by train.

Lumber and building materials
Gravel, cement, rock, and sand
General appliances, including refrigerators, radios, T.V.

Learning the train arrives sometime between 11:30 p.m. and 3:00 a.m., daily, and is unloaded around 8:00 a.m.

Learning the right-of-way was owned by the Pacific Electric Company, with transfer made to Southern Pacific in October, 1964.

Studying pictures to learn the make-up of a freight train: the engine, box cars, gondola and hopper cars, flatbed cars, and caboose.

Inquiring what happens to the cargo, once it is unloaded.

Learning that some cargo brought into Santa Monica stays in this area near the tracks: lumber, e.g., is delivered to nearby lumber yards and manufacturing plants; building materials (cement, rock, gravel, and sand, e.g.) are delivered to construction and building materials suppliers.

Learning that some cargo is moved, by truck, out of this area: furniture and appliances, e.g., are transported to stores in the Central Business District.

<u>Using documentary sources to obtain information on trucking functions in Santa Monica.</u>

Studying photographs of truckers at work, delivering merchandise to loading ramps; unloading; exchanging bills of lading, etc.

Identifying major truck types from the photos.

Observing how dump trucks deliver sand and gravel to the city maintenance yards for road work.

Observing how semitrailers supply the large department and furniture stores.

Classifying trucks by the major functions they serve.

Determining the Factors Accounting for the Major Transportation Routes Into and Through the City. (2nd Grade Only.)

Studying a composite air photo of the community, and a terrain model of the Los Angeles lowlands.

Identifying, by number of traffic lanes and associated urban structures, the major (1st and 2nd order) arteries in the community.

Searching for "patterns of association" characterizing these arteries. For example, children might discover:

They are, for the most part, east-west arteries.

They "connect" Santa Monica with Los Angeles, to the east.

Unlike the north-south streets in the community, they meet no canyons, mountain ranges, or major change in topography.

Comparing with Highway 101, the major "north-south" first order artery, and with Lincoln Boulevard.

Noting, e.g., that Highway 101 is built on the level coastal strand, and is for most of its length between Santa Monica and Malibu, flanked to one side by high-rising palisades and the Santa Monica mountains.

Observing that Lincoln Boulevard, which similarly runs in a generally north-south direction, is built entirely on the level "mesa" on which Santa Monica is located, and derives its heavy traffic from its access to coastal cities to the south.

Refining an inference concerning transportation routes in and through Santa Monica. Incorporating, in the generalization, factors of terrain, population, and inter-urban exchange.

For example, children might infer major arteries are developed between population centers, to facilitate the movement of people and products, and are influenced by the terrain; that is, they are more likely to develop on level or graded land, and to follow natural passes where a choice is possible. (Note: in the grade 3 curriculum, this inference is modified to take into account historical antecedents in transportation.)

The teacher can help children test this inference against the data of the new freeway route, and judge whether, as stated, their inference is supported by this new "instance."

<u>Developing Transportation Patterns in Santa Monica with the aid of Land-Base Models</u>.

Adding trucking activities to the already-developed layouts of the local neighborhood and Central Business District.

Locating terminals and street patterns.

Extending masking tape on the floor to interconnect the two regions.

Adding trucks and model cargo to the layout.

Using the models in dramatic play to simulate patterns of activity (commercial and transportation) within the community.

Recognizing a need for a third community region, the railroad and industrial center, to complete the ground transportation system bringing cargo and merchandise into Santa Monica.

V. MAJOR ORGANIZING CENTER: INQUIRY INTO THE INDUSTRIAL REGION

A. INSTRUCTIONAL OBJECTIVES

Children will demonstrate knowledge of major geographic features and their functions in the industrial region.

Children will demonstrate understanding of patterns of areal association within the industrial region. Patterns of areal association will include:

(a) spatial and functional relationships between rail and truck routes.

(b) spatial and functional relationships between the incoming rail line and locations of industries.

Children will demonstrate understanding of patterns of functional relationship between the industrial region and other functionally defined regions. For example:

(a) relationships between the transportation facilities in the industrial region and stores of the CBD.

(b) relationships between construction suppliers and manufacturers in the industrial region and home and apartment construction in the residential areas.

(c) relationships between city maintenance supplies and services in the industrial region and street repair, park service, and so on, in the community.

Children will apply the concept of areal association in formulating and refining inferences concerning changing patterns of human occupance of the land. (Grade 2, only.)

B. LEARNING OPPORTUNITIES

Obtaining Information on the Railroad and Industrial Region in Santa Monica.

Planning a field trip to the industrial region of Santa Monica, to obtain information concerning the layout and functions carried on here.

Studying an airphoto of Santa Monica to locate the rail lines.

Locating the major arteries in this region: Olympic Boulevard, Santa Monica freeway, and Cloverfield Boulevard.

Observing how the rail line, Olympic Boulevard, and the freeway parallel each other in this region.

Projecting some hypotheses concerning what activities might be going on in the large structures that occupy this region.

Taking a field-study trip to the industrial region.

Approaching the region via Colorado Avenue. Noticing how land-use patterns change from residential and commercial to something new.

Observing the large gray sheds, loading ramps, and semitrailers parked here.

Observing railroad sidings, stationary box cars, fork-lift truck, and stands of lumber and finished doors, crated cargo, etc.

Suggesting some of the activities apparently carried on in this region.

Visiting a lumber yard located on Colorado Avenue, where incoming lumber from flat-bed cars is being unloaded and stored.

Visiting Higgins Brickyard, located on Cloverfield Boulevard, where mixing and production of bricks is carried on, drying bricks are stored, and later moved out on large flat-bed trucks to buyers.

Visiting a door-manufacturing plant, located on Colorado Avenue, where incoming lumber is converted to doors, and finished doors are loaded on box cars for shipment out of the community.

Observing other facilities in the area: the city maintenance yards; the General Telephone pole yards; Systems Development Corporation; china manufacturing; Douglas Aircraft Company (gradually departing this area, and selling these facilities to General Telephone).

Observing the nearby freeway under construction. Noting overpasses under development, transit cement mixers in operation, variety of heavy road-work equipment.

Conjecturing about possible truck uses of this freeway, when completed, in bringing cargo into Santa Monica.

Learning the railroad is becoming less important in Santa Monica as businesses turn, increasingly, to trucks to meet their transportation needs.

Inquiring into the effects of this change.

Suggesting some reasons this change will or will not greatly affect this region as an industrial area. For example:

The region is already <u>zoned</u> for industry.

Industries are already <u>located</u> here.

Olympic Boulevard and the freeway (two major truck access routes into Santa Monica) are both routed into this same area.

There is not much other accessible land in Santa Monica.

Developing a Land-Base Model of the Industrial Region, with focus on the transportation facilities here.

Locating on the masonite boards the basic street pattern of this region.

Correctly aligning the boards in a north-south direction.

Identifying and labeling major arteries: Olympic Boulevard, Colorado Avenue, the freeway, Cloverfield Boulevard, and the railroad tracks.

Developing the railroad system.

Placing model cars (box cars, gondola or hopper cars, flat beds, engines) on the sidings and main line entering the region.

Determining proper placement of cars and sheds with the assistance of an air photo of the region.

Adding industrial features of the region, through consultation of an air photo of the region.

Locating Higgins Brick Yard, and placing models representing the office, working equipment, bricks, and trucks.

Locating the City Maintenance Yards, and placing the vehicle maintenance garages, offices, sand and gravel supply, and rubbish collection trucks.

Locating the Redwood Lumber Company and placing office structure, drying sheds, and lumber supply.

Adding, similarly, structures at the General Telephone Company pole yards, and the industries on Olympic Boulevard, Colorado, and the other major arteries represented.

Engaging in Functional Analysis of Selected Industrial Operations in the Region.

Selecting the following industries for study.

Brick-making at Higgins Brick Yard

Door-making at the Hayley Company.

Maintenance yard activities at the City maintenance yards.

Obtaining information on the sequence of activities engaged in, and classifying, for each.

Viewing project-produced photo-sequences to recall the activities viewed on field trip.

Developing a flow-chart, to classify activities by operation and in time-sequence.

Raising inquiry concerning the future of the Higgins operation in Santa Monica. (2nd grade only.)

Learning the company has nearly exhausted the available adobe resource at its present site.

Inquiring what alternatives the company has. For example, children might suggest the following:

It could acquire more land in Santa Monica.

It could import adobe soil.

It could move.

Obtaining information on the alternatives suggested. (Zoning, for example, and present land-use makes no further land within the region available.)

Learning, in addition, its operation in Santa Monica is not fully automated. That with automation, the work done in 3 months could be accomplished in 30 hours.

Hypothesizing what the company might do. (Adding the ideas of changing tools and manpower needs to the factors of land and transportation costs, for example.)

Learning from a company official that a move is planned, to a new plant site already developed by the company, and fully automated.

Thinking about some possible consequences of the move, for the company and for Santa Monica.

Drawing a refined inference concerning where industries locate. Incorporating factors of resources, labor supply, transportation, technology, market, and zoning laws.

Raising inquiry concerning changing problems in refuse disposal in Southern California (2nd grade only).

Learning the rubbish brought in daily to the City Maintenance Yards can no longer be incinerated there, due to smog-control laws.

Noting the now-abandoned incinerator stacks in the maintenance yard areas, as an example of a now-discussed function. Drawing the inference, with teacher assistance, that "man changes the land." His works occupy the landscape. Present patterns sometimes reflect earlier land-use patterns. (Be certain that children draw this inference in their own words.)

Recalling the amount of refuse delivered, within the few minutes observed during the field study trip.

Hypothesizing ways a city might go about removing its rubbish. Considering that a solution which put the rubbish to productive use would be preferred.

Studying photos of major land reclamation activities in the mountain region to the north, where rubbish is delivered as "fill," and where urban construction is planned on "filled" land which is now unusable.

Tracing the routes of the larger transit trucks to the mountain-"fill" areas.

Studying the cooperative work of rubbish collection crews, leveling operations, and city planners.

Drawing an inference concerning functional relationships between this city maintenance operation and land development operations.

Evaluating the consequences of this choice against others suggested for rubbish removal. (For example, "dump it in the ocean.")

Comparing these data with their earlier inference, namely, that "man changes the land."

> Does the inference draw further support from these data on "fill" operations?
>
> Can it be better stated (further refined) now?

Developing Patterns of Functional Relationship Between the Industrial, Commercial, and Residential Regions of the City.

Relating this industrial region to the CBD and the children's residential neighborhoods by interconnecting boards of the 3 regions with masking tape applied to classroom floor and representing the major traffic arteries between them.

Developing in dramatic play, with the use of model trucks, trains, and cargo, the movement (patterns of circulation) of cargo in Santa Monica.

Adding semaphore signals and traffic control lights.

Determining right of way.

Moving model cargo from trains to sheds, and to industrial sites and Central Business District loading ramps by truck.

Developing, through dramatic play, patterns of functional relationship between the industrial region and other regions in the city. For example:

Moving "street maintenance equipment" from the City Maintenance Yard to a residential neighborhood.

Moving "telephone service equipment" from the pole yards of the company in the industrial region to places in the residential and commercial districts, to give telephone service, or to establish new telephone lines.

Moving, by flat-bed truck, a load of "bricks" from the Higgins Brick Yard in the industrial region to a construction site in one of the other regions of the city.

Moving a load of "lumber" from one of the lumber yards in the industrial region to a construction site in one of the other regions of the city.

Moving "cement products" and "freeway construction equipment" from the industrial area to work-sites on the freeway.

Drawing Interpretations Concerning this Region.

Defining a basic relationship between (1) the train and (2) land use in the area surrounding the tracks (including storage facilities, trucking services, and the receiving companies in the industrial and commercial zones of Santa Monica).

Defining the relationship between this industrial-transportation complex and the consumer regions of Santa Monica.

Studying the Instructional Acetate Map Series, which shows this relationship:

(a) between railroading and trucking in Santa Monica;

(b) between the RR siding and transport routes into Santa Monica.

(c) between the industrial region and the Central Business District; the Central Business District and residential regions; the industrial region and the residential regions.

Learning to use the terms industrial, commercial, and residential to differentiate the three regions.

VI. MAJOR ORGANIZING CENTER: INQUIRY INTO ROCK PRODUCTS INDUSTRIES. (2nd Grade Only.)

A. INSTRUCTIONAL OBJECTIVES

Children will demonstrate knowledge of major landforms of the extended Los Angeles region.

Children will demonstrate understanding of patterns of areal association in the location of mining and processing sites. Patterns of areal association will include:

(a) relationships between granitic mountains, rivers, and rock mining sites located where the river levels off at the valley below.

(b) relationships between desert sources of limestone, shale, and silica, population centers (for labor supply), and transportation access in the location of cement plants.

(c) relationships between transportation systems and markets in the location of mix plants.

Children will demonstrate the ability to draw a warranted inductive inference from relevant supporting data. For example:

(a) from examples of rock mining sites, children will correctly identify features all sites have in common, and infer, from those features, a valid statement concerning where rock mining operations locate.

(b) from examples of cement plant sites, children will correctly identify features all these sites have in common, and infer, from those features, a valid statement concerning where cement plants locate.

Children will demonstrate the ability to draw valid deductions from inductively-arrived-at inferences, in a process of on-going inquiry. For example:

From the premise that freeways generally cause urban "spread," children may infer that if a freeway is extended into Malibu, this relatively undeveloped area will probably undergo rapid population growth and change.

Children will demonstrate understanding of patterns of areal relationship in the transportation system of the extended Los Angeles region. For example:

Producers of rock products and cement, processors (in the mix plant operations), and consumers are functionally and inter-regionally related through the transportation system which spatially links these operations.

Children will be able to apply the concept of "areal association" in determining what factors "associate" in the location and development of major traffic arteries in the extended Los Angeles region.

Children will apply the concept of areal association in further refining inferences concerning changing patterns of human occupance of the land.

VI. MAJOR ORGANIZING CENTER: INQUIRY INTO ROCK PRODUCTS INDUSTRIES. (2nd Grade Only.)

B. LEARNING OPPORTUNITIES

Inquiring into the sources of sand, rock, and gravel that daily come into Santa Monica for building, street, and freeway construction.

Applying the concept of areal association in suggesting, as hypotheses, source-locations for these basic construction materials.

Consulting a terrain model of the larger Los Angeles lowlands, mountain rim, and desert regions beyond.

Identifying major landforms in the extended region. Hypothesizing locations by placing small red wooden "buildings" (1/2" x 1/2") on suggested sites on the terrain model. (For example: in the mountains, along sea coast, in desert.)

Obtaining data (teacher-presented).

Observing how a stream of water, turned on a soil box simulating a mountain range, loosens sand and carries it "downhill" to the "valley" below.

Comparing samples of sandstone and granite. Learning which is more durable. Determining which would be preferred for heavy-use construction.

Studying the terrain model. Learning the Santa Monica and San Gabriel mountain ranges are granitic.

Refining their hypothesis.

(Children might, for example, move the "red building" sites to the Santa Monica and San Gabriel mountain regions, and--if they understand the implications of the soil-box demonstration--suggest placing them along streams, in the foothills.

Verifying their hypotheses.

Consulting an acetate-overlay map system super-imposed on a photo reproduction of the terrain model.

Observing: Layer 1, the rivers in blue; Layer 2, locations of rock and gravel mining sites, identified by picture symbols of red building.

Classifying data by sites (Pacoima, Azusa, and Santa Clara river sites, such as Saugus, Fillmore, Santa Paula, and El Rio) and the characteristics of each.

Drawing an inference (inductive) by identifying the characteristics all these sites have in common: located on rivers, in foothills of the granitic range, where velocity of the rivers is slowed as rivers level off, and the rivers deposit their sediment.

<u>Inquiring into the sources of cement that daily comes into Santa Monica for construction purposes</u>.

Applying the relationship earlier formulated as a "knowledge-claim" in the new inquiry. (For example, children might reason:)

Rock and gravel are mined in places where the best rock is found, and where it can be most easily mined.

Cement, likewise, must be produced where-ever cement products can be found and "mined."

Determining "search-strategies."

What information do we need before we can make reasonable hypotheses?

How can we verify our hypotheses, after they are made?

Obtaining data on cement production.

Learning limestone, shale, silica, and other rock products are used in the manufacture of cement.

Learning the desert region to the east and north of Los Angeles is rich in these resources.

Applying the concept of areal association (between resource and mining site) in hypothesizing plant locations.

Using small yellow buildings (1/2" x 1/2") and placing on terrain model to suggest their sites.

Verifying their hypotheses by comparing against data.

Comparing with data on acetate layer 3, which locates sites at Colton, Victorville, Riverside, Oro Grande, and Monolith.

Determining the critical features which these sites have in common. (For example:)

Accessibility to valuable rock quarries.

Accessibility to a labor supply.

Accessibility to transportation (all are on main railroad lines).

Revising, as needed, their inference or knowledge claim, on the basis of tested data.

Obtaining information on activities in rock mining and cement production.

Viewing photos and films of the processes involved.

(1) Quarrying at the rock site
Blasting, drilling, and scooping operations

(2) Moving the rock and gravel: Use of power shovels and dump trucks; hopper and gondola cars

(3) Crushing and grinding operations:
Use of "rotary," "jaw," and "roll" crushers for primary crushing.

Use of "hammer mill" for secondary crushing

(4) Blending operations, (where portland cement is made):
Fine grinding (wet or dry combining in the kiln)

Finish grinding

(5) Storage operations and loading

(6) Transporting by truck and rail cars
(hopper, gondola, and tank cars)

Obtaining information on "mix plant" operations.

Learning concrete building materials require the correct mixture of cement, water, and aggregates (sand and gravel).

Learning about the variety of mix operations: transit-mixers, for small jobs; on-site mix operations for freeway construction; permanent mix-plant operations, as those provided by concrete companies in the local industrial region.

Developing understanding of inter-regional relationships (as an extension of their knowledge claim).

Viewing layers 4 and 5 of the acetate overlay system, showing (4) locations of mix plants and (5) the transportation system interrelating producers of rock products and cement; processors (mix plants); and consumers.

Viewing photos of truck and rail car delivery of rock, gravel, and cement to:

Railroad sidings at the Consolidated Rock Products Company, Pico Boulevard near Sepulveda.

Redi-Mixed Cement, Sepulveda Boulevard in West Los Angeles.

Jones Concrete Company, in the Industrial center, Santa Monica.

Studying the terrain model and the acetate map series to see how terrain and market system have influenced routes.

The "passes" through which the roads and railroads enter the basin.

The influence of slow-moving cement carriers on the original grading of Sepulveda Boulevard.

The special railroad spurs carrying building materials to the markets of Santa Monica and the Pico-Sepulveda region.

Summarizing all of this information in a statement which demonstrates children's understanding of the inter-regional functional relationships operating here.

<u>Considering how all of these activities are changing the Los Angeles region.</u>

Viewing a kodachrome slide presenting an airview of greater Los Angeles at mid-day. Observing how the Basin is almost a "sheet of concrete," in its freeways, streets, and construction.

Comparing with air photos of forty years ago.

Learning that present patterns of occupance may be temporary, too.

Viewing slides from a rock products company in the San Gabriel area depicting its operations.

Viewing air photos of its operations, and the development of new freeways and a new commercial district on land it had hoped to claim for extension of its mining activities.

Learning that "zoning" now makes this land unavailable for mining.

Comparing with the situation already examined in relation to mining operations within Santa Monica.

Considering problems city governments face in reaching decisions where conflicts of interest are involved.

Suggesting some criteria to be used in reaching decisions in situations such as these. Evaluating in terms of their consequences for all parties involved.

Finding out about Freeway Construction

Recalling, from the air-view of greater Los Angeles, the network of freeways lacing the basin.

Taking a field trip to the local construction site, to observe freeway construction in process.

Viewing a film-strip of freeway construction, from initial bulldozing to final surfacing.

Determining where the Santa Monica Freeway will go, and how it will relate within the larger freeway system.

Studying the terrain model of the Los Angeles Basin.

Locating Santa Monica, and the freeway construction site, on the model.

Tracing, with red grease pencil, major freeway arteries already linking the Los Angeles Civic Center with the Harbor, San Bernardino, and the San Fernando Valley.

Observing how the Santa Monica freeway links the Los Angeles Civic Center with the Santa Monica community, and channels traffic, via the San Diego freeway, to the Los Angeles Harbor and points south.

Inquiring into Some Effects of Freeway Construction.

Studying the air photo (taken prior to ground clearing activities) and observing how many structures had to be removed to make land available for the freeway.

Studying the photo and suggesting some possible changes in traffic patterns within the local community.

Hearing a story about urban growth in Garden Grove where population increased ten times its pre-freeway total within months after the completion of the freeway.

Considering some possible effects of the planned Pacific Coast Freeway, joining the Santa Monica freeway, to channel traffic north-west along the coast through Malibu.

Extrapolating from the Garden Grove instance. (Urban-industrial spread.)

Suggesting possible changes in life in Malibu.

Suggesting possible changes in their own family activities, once the freeway is completed.

VII. MAJOR ORGANIZING CENTER: INQUIRY INTO THE HARBOR REGION

A. INSTRUCTIONAL OBJECTIVES

Children will demonstrate knowledge of basic natural (physical) features of the Santa Monica Bay region.

Children will demonstrate knowledge of the features and functions of the pier and its associated recreational harbor.

Children will demonstrate the ability to draw a warranted inference from relevant supporting data. For example, from comparative study of:

(a) open-piling piers at Venice, Ocean Park, and early Santa Monica and

(b) breakwater at present-day Santa Monica,

children will appropriately infer the coastal formations associating with each.

Children will demonstrate understanding of causality in the changing shoreline, by giving an appropriate explanation of why the early shore was wider in Santa Monica than it is today.

Children will demonstrate the ability to draw a valid deduction from a premise, in a process of on-going inquiry. For example:

> From the premise that man-made obstructions to the littoral drift cause changes in the formation of Southern California beaches, children may infer that construction of a causeway in Santa Monica Bay may effect changes in beach formations to the south.

Children will demonstrate the ability to define value-conflicts involved in policy-making. For example, in an inquiry into whether the bay area will be better or worse off if a causeway is built, children will be able to define the basic value conflict.

VII. MAJOR ORGANIZING CENTER: INQUIRY INTO THE HARBOR REGION

Obtaining Information on the Santa Monica Harbor.

Planning a field trip to Santa Monica Harbor, to observe another geographic center of the community.

Relating the school and the harbor area.

Recalling the Central Business District and clock tower, familiar landmarks to be seen on the way.

Noticing in photos the bay, mountains, and shoreline. Learning these are natural features.

Noticing in photos the pier, boats, and breakwater. Learning these are features that people put there.

Taking the study trip to the harbor.

Standing on the palisades and locating basic landforms in the area: the bay, the Santa Monica Mountains, the coastal strand, the bluffs, and the mesa.

Walking along Santa Monica Pier, and observing how the surface of the land changes as one walks seaward along the pier: (1) the mesa; (2) the bluffs, (3) the shore or coastal strand, and (4) the ocean.

Stopping near the far end of the pier, and looking back to shore. Identifying, from this vantage point, the same natural features.

Taping a large air photo and a large terrain model of the region to the pier (flat, on the walkway). (Be certain to line up properly with the N-S directions.)

Becoming oriented to the maps. Finding, on the air photo, specific features observed in the landscape.

Applying the concept of "areal association" in observing and classifying the features observed.

Recognizing cultural features on the mesa: the "clock tower" and familiar hotels from their study of the CBD. Identifying that region.

Noting the bluffs are unoccupied. The buildings directly below are abandoned. The railings at the top carry warning signs. Only vegetation and a recently-buttressed road down the bluff front "associate" with this place.

Recalling the major slide just to the north, where the bluff gave way, and much of the palisades came down.

Noticing the springs emerging from the slopes. Observing dampness of the bluffs and the generally "loose" quality of the soil.

Debating what to use as a classification system for the coastal strand. Commercial because of the "hot dog stands" observed there? A "play region" because of activities possible there? Etc.

Observing wild life features that "associate" with these areas: sand pipers on the beach; gulls, pelicans on the pier; barnacles on the pilings; fish in the ocean.

Deciding how to classify the pier itself: commercial, because of the gift shops, bait and tackle suppliers, fish markets, and restaurants? A "play region" (recreational) because of fishing, boating, and "fun house?" Choosing other ways they might classify, to include the harbor - control office of the U.S. Coast Guard, with its associated harbor patrol boat, the hoisting operation for small boats, boat maintenance activities, moorings in the water, the breakwater, and so on.

Comparing harbor development along the coast.

Locating Ocean Park Pier and Venice Pier.

Observing both piers on the air photo, and comparing differences in the coastal strand at the Santa Monica Pier and at the other two piers. Noticing the sharply widened beach just to the north-side of Santa Monica Pier, only.

Leaving, as open inquiry, the question why these beaches differ.

Counting the number of boats tied to moorings (very few). Noticing that one row of moorings is no longer used.

Finding out how the shoreline is changing. (2nd grade only.)

Observing on the terrain model the major landforms of the region.

The mountains
The level mesa
The bluffs
The shoreline

Recalling from lessons on sand and gravel how downward flowing rivers from the mountains carry alluvium, sand, and gravel, with the following consequences:

Deltas result where rivers deposit silt directly into the ocean. (Malibu example.)

Alluvial fans result where rapidly flowing streams spread out suddenly over flats. (Santa Monica example.)

Studying the effects of the depositions along the palisades: layers of poorly sorted gravels and clay soften when wet, ooze, and give way. Landslides on these bluffs, therefore, are normal.

Learning the seashore is also being eroded by the sea, and bluffs are being further eroded back.

Summarizing all these effects into a single relational statement concerning deposition and erosion effects constantly in operation.

Viewing historic photos of Santa Monica and observing how much wider the beach area was at one time. Explaining why, by applying the relational concept.

Inquiring about the unique shoreline configurations observed on the study trip.

> Realizing that no river "associates" with the extended beach observed just north of the pier. Therefore, it cannot be a deposition from the land (a delta, e.g.).
>
> Focusing on the inquiry, where does this build-up of sand come from?
>
> Hypothesizing possible wind, sea, and human factors.
>
> Observing a demonstration of wave action along the Southern California Coast. This "littoral drift" moves southeast, carrying along the pebbles and gravel brought down from the mountains by rivers.
>
> Observing how waves, breaking obliquely on these beaches grind and erode the pebbles to fine sand, and deposit them, finally, as far south as Playa del Rey, where wind movement further carries the finely ground sand as far inland as the Los Angeles Airport.

Observing a sequence of three photos of the Santa Monica portion of this shoreline, taken (1) when the open-piling pier was built, (2) when the breakwater was first constructed, and (3) a few years after the breakwater was constructed.

Hypothesizing. (For example, the children might suggest the construction of the breakwater might be the critical factor, since the unusual widening of the beach to the north-side of the pier occurred following its construction.)

Comparing with photos of the Venice and Ocean Park shoreline, where open-piling piers are presently built, and no such build-up of sand is evident. Judging whether the evidence warrants their conclusion.

Questioning why the breakwater might create this effect. Considering what happens if the free movement of the littoral drift is obstructed by man-made structures in the bay.

Learning the building of the breakwater has caused problems.

The harbor itself has to be regularly dredged to keep it deep enough for moorings. The sand carried southward by the littoral drift gets deposited here and boats can no long find deep water close to shore. The breakwater is, in a sense, "self-defeating."

Other communities to the south object if their beaches don't receive a continuing supply of new sand from freely moving littoral drift. Building out into the water can create regional problems. The cities, therefore, cooperate on statewide planning to develop and save their valuable beaches.

Inquiring how plans to build a causeway out across the bay will further change the shoreline. (2nd grade only.)

Obtaining data on causeway plans for the projected coastal freeway.

Consulting maps from the Engineers Office, and State Highway Commission planning maps, reproduced by the community newspaper.

Studying the proposed changes and classifying as "natural" or "manmade."

Hypothesizing some possible effects.

For example, proposing some "interaction - effects" of these planned structures, built into the bay, on the action of the littoral drift. (An application of the relational concept.)

Comparing with engineers' reports concerning wave action on the seaward side of the proposed causeway.

Comparing with economists' reports concerning land values and community development in a new "marina," should the causeway be approved.

Holding their judgments tentative.

Learning action has not been taken, and the data (the consequences) are not yet in.

Using data from marina developments at coastal cities immediately to the southeast as useful data-sources for anticipating possible effects.

Learning that to build one of these marinas (yacht harbors) it was necessary to destroy natural marshes which were a refuge for over 80 species of waterfowl.

Discussing whether people would all agree a yacht harbor is more valuable than a refuge for wild birds.

Learning that decisions require choices between values.

Learning that proposed causeway plans will not seriously alter the character of this harbor. It would still be largely a "recreational" region. They will, however, very much alter the character of the "bay" (and therefore are controversial).

Considering the alternatives for personal and family enjoyment of this region: conflicting interests in preserving a natural landscape or creating a man-made marina to occupy the inner bay area.

VIII. MAJOR ORGANIZING CENTER: INQUIRY INTO LOS ANGELES HARBOR REGION. (Contrastive Analysis, 2nd Grade Only.)

A. INSTRUCTIONAL OBJECTIVES

Children will demonstrate knowledge of basic features and their functions in Los Angeles Harbor.

Children will demonstrate ability to read the features of an air photo of Los Angeles Harbor: Terminal Island, the breakwater, the main channels, the bridges, railroad tracks and yards, oil refineries, and lumber yards.

Children will demonstrate understanding of patterns of areal association within the industrial harbor. Patterns of areal association will include:

(a) spatial and functional relationships between rail lines in the harbor and the location of harbor industries.

(b) spatial and functional relationships between Fish Harbor and the fish canning industry.

(c) spatial and functional relationships between oil refineries and the oil company piers (for loading tankers).

Children will demonstrate understanding of patterns of functional relationship between the industrial harbor and other functionally defined regions. For example:

(a) relationships between oil producing regions, oil refineries at the harbor, oil transporting facilities, and oil-products consumers (service stations, e.g.).

(b) relationships between fish activities out of Fish Harbor, fish canning (processing), and markets in Santa Monica and greater Los Angeles

(c) relationships between lumber and banana import activities and markets in the lumber yards and supermarkets of Santa Monica and greater Los Angeles.

Children will demonstrate the ability to apply the concept of areal association by predicting some relevant consequences if Santa Monica had maintained its early railroad line to its harbor.

VIII. MAJOR ORGANIZING CENTER: INQUIRY INTO LOS ANGELES HARBOR REGION. (Contrastive Analysis, 2nd Grade Only.)

B. LEARNING OPPORTUNITIES

Developing a Knowledge - Claim Regarding Harbor Development in the Los Angeles Region.

Observing an exhibit of documents concerning an earlier period in the history of Santa Monica Harbor. (Photos, maps, and early newspapers.)

Hearing a story about early times in Santa Monica's history, when a railroad was built out to the pier.

Looking at pictures of early railroading on the Long Wharf.

Tracing the route of the railroad into Santa Monica and out onto the Long Wharf, where ships were loaded and unloaded.

Learning the railroad company lost its franchise to the sea, and the Long Wharf was torn down.

Suggesting what might have happened if the railroad still ran all the way to the sea. For example:

Demonstrating understanding of the concept of areal association by suggesting, for example, Santa Monica's industrial region would probably have developed here at the harbor.

Suggesting, for example, Santa Monica's Harbor might today be a busy port, with industries, instead of a recreational harbor.

Determining how to test the validity of the knowledge claim (that a railroad line would have drawn industry to the harbor region).

Suggesting, for example, that one way to test the idea is to find out about other harbors.

Looking at the regional Los Angeles map, with railroad lines marked.

Hunting for a harbor with railroad lines, as a test case.

Rejecting the piers they know about: Venice and Ocean Park. They are not harbors since they have no breakwater or natural barrier to protect ships from the heavy waves of the open sea.

Finding Los Angeles' San Pedro Harbor.

Observing that rail lines do run there.

Predicting, from their premise, that industry should be located at this harbor.

<u>Taking a Field-Study Trip to Los Angeles' San Pedro Harbor</u>.

Planning the trip.

Studying the regional terrain model to locate Los Angeles Harbor in relation to Santa Monica Harbor.

Locating the freeway system linking the two regions, and the route the school bus will take.

Viewing a large harbor map and locating:

(1) the breakwater,

(2) the outer and inner harbor,

(3) the channels,

(4) Terminal Island, and

(5) the piers.

Observing how the railroad runs south from central Los Angeles to the harbor (a distance of about 20 miles) and that the tracks then fan out to parallel the water-front of the harbor.

Learning that the four railroads serving the harbor pass within 1/2 mile of each other as they enter the habor district, and that a major receiving and classification yard serves all of them at the harbor.

Learning that, in addition, numerous small yards are located within the harbor and make it possible to move and exchange cars swiftly within the harbor area.

Noting how the major coastal highways (San Diego Freeway, Harbor Freeway and Long Beach Freeway) similarly "associate" with the coastal topography and the population centers.

Planning their itinerary, and specific features to be seen.

Taking the all-day trip to Los Angeles (San Pedro) Harbor.

Observing, on a large map, mounted in the bus, the progress of their route. (As an alternative, children might be supplied with individual maps and marking crayons, and record their route as they go. The teacher would then assist, with the aid of the loud-speaker and the oversize map.)

Touring the Harbor, with selective observation of features at the following places: oil refineries and tanks in the West Basin region; Sun Lumber Company; the fruit terminal; Vincent Thomas Bridge, connecting Terminal Isalnd and the mainland; Fish Harbor with its fish canneries; shipyards; and the Marine Exchange.

Boarding a boat at Norm's Landing for a harbor tour through the Inner Harbor and Main Channel. (Optional.)

Eating lunch at Cabrillo Beach, and viewing the 9-mile breakwater, built out from this promontory.

Retracing their harbor tour on a large air photo of the region.

Recalling the train tracks (major lines and sidings) observed at Sun Lumber and paralleling the Main Channel.

Locating these features on the photo.

Deciding what activities of this harbor could be classified as "industrial," (fish canning, ship building, and oil refining, e.g.).

Developing a Base-Model of Los Angeles Harbor

Locating on the masonite boards, the basic features of this region: the land and water area; the mainland and the channels; rail lines and the Turning Basin.

Defining, with the aid of the Harbor Map, the exact region represented by the boards.

Determining, with the assistance of the enlarged air photo, the features of this region.

Adding structures representing oil tanks and refineries.

Adding features of the Sun Lumber Company, Todd Shipbuilding, the fruit terminal, warehouses and piers.

Adding ships, trains, and motor vehicles.

Simulating activities in the harbor through dramatic play.

Comparing Los Angeles and Santa Monica Harbors.

Recalling their earlier prediction: that Los Angeles Harbor, with its rail lines, probably developed as an industrial harbor.

Determining whether or not the evidence warrants the conclusion.

Learning that, in addition to industry, Los Angeles Harbor is also a major port, and handles the largest tonnage in cargo of all U.S. harbors on the Pacific Coast.

Learning some of the cargo handled, and classifying as imports (lumber, bananas, and fish, e.g.) and exports (refined oil, borax from the desert, and manufactured products, e.g.).

Developing Understandings of the Functional Relationships between Los Angeles Harbor and the greater Los Angeles region.

Learning that oil, drilled and refined in the Los Angeles region, is transported by tankers as one major export from Los Angeles Harbor.

Learning that oil, refined in the harbor area refineries, is also transported by oil tank trucks and by pipelines to markets in Los Angeles and Santa Monica.

Relating the oil industry in Los Angeles Harbor to family welfare in Los Angeles and Santa Monica. (Children might, for example, suggest):

It supplies gasoline for gasoline stations.

It provides jobs for oil workers, truckers, longshoremen, merchant seamen, and business men.

It increases capital in the region, and encourages growth in other businesses. (Workers, e.g., can buy things they need and that, in turn, creates more jobs.)

Anticipating some other ways that industries and operations at Los Angeles Harbor are functionally related to people living in the larger (extended) Los Angeles region. (Children might suggest, for example):

Fishing and fish canning are one way. We buy canned tuna from the canneries on Terminal Island at local supermarkets.

or

Lumbering is a way. Sun Lumber gets in huge shipments of lumber from its ships, and then the lumber is moved to lumber yards in Santa Monica and Malibu by rail and truck. That way, people get the lumber they buy for their houses and fences.

Engaging in functional analysis of selected industries and trade activities of Los Angeles Harbor.

Selecting from among the following: fishing and fish canning; lumbering; banana imports; oil refining and exports.

Obtaining information on the sequence of activities engaged in, and classifying.

Obtaining information from trade books, films, and project materials, relevant to the selected industry or product.

Developing a flow-chart to classify activities by operation, and in time-sequence.

Studying the acetate overlay map system designed to illustrate functional relationships between activities in the harbor region and in greater Los Angeles.

Layer 1: outline map of the Los Angeles region, replicating the area of the terrain model.

Layer 2: identification of Los Angeles Harbor, with lumber symbol locating Sun Lumber.

Layer 3: symbols locating lumber yards in central Los Angeles and in Santa Monica.

Layer 4: railroads interconnecting Los Angeles Harbor, central Los Angeles, and Santa Monica.

Layer 5: symbols locating oil refineries in Los Angeles Harbor.

Layer 6: freeways linking the refineries and gasoline stations in Los Angeles and Santa Monica; ocean-going tankers linking the Harbor to other ports.

Layer 7: fish symbol locating Fish Harbor and canneries.

Layer 8: freeways and coastal water-route, used in transporting fresh and canned fish by (1) truck and (2) boat to (1) supermarkets in Los Angeles and Santa Monica, and to (2) fish markets and restaurants on Santa Monica pier.

Applying the functional concept by "telling the story" of another product (and tracing its probable route on the acetate map). Children might, e.g., "tell about" bananas imported to the harbor and moved to supermarkets, as an application of this same functional concept.

Summarizing all of this information in a statement which demonstrates children's understanding of the inter-regional functional relationships operating here.

Considering how, in developing all these activities, man has changed the land.

Contrasting historical photos of San Pedro with photos of the region today.

Observing that the railroads were built from the time of the harbor's founding, but that much has been added, since:

Terminal Island, the freeways, Vincent Thomas Bridge, new wharves.

Learning that dredging must go on, to keep the channels clear.

Learning that the Harbor Commission is seeking new ways to increase trade and growth of the harbor. Anticipating what changes may come.

APPENDIX D

EXPERIMENTAL CURRICULUM A
GRADE 3

I. MAJOR ORGANIZING CENTER: ORIENTATION TO RELATIVE LOCATION.

A. INSTRUCTIONAL OBJECTIVES.

Children will demonstrate the ability to project routes as linear extensions between established points on a map grid.

Children will be able to find places and to project routes on a map, using a street (grid) system as a coordinate reference system.

Children will be able to arrange four neighborhood models in order of decreasing scale, and to locate properly the model structures which associate with each.

Children will be able to locate certain major features in the landscape in relation to their school on each of the following maps: a large scale street map of the immediate neighborhood; a lesser-scale street map of the larger community; a regional map of the entire Los Angeles region.

I. MAJOR ORGANIZING CENTER: ORIENTATION TO RELATIVE LOCATION.

B. LEARNING OPPORTUNITIES

Establishing Space Concepts Within the Immediate Neighborhood.

Engaging in field study of the immediate school neighborhood, for data to assemble neighborhood model.

Locating school on the regional (neighborhood) map.

Determining key residential and commercial structures in the immediate school neighborhood, and marking locations on the working map (blank map, except for streets).

Developing a base-model of this region.

Locating on the masonite boards the arteries and their intersections identified on the field study walk(s).

Referring to their field-study data map (developed in the field) and to an air photo of the neighborhood in order to recall the structures and their locations in the neighborhood.

Placing the wooden models, replicating these structures, in their proper positions on the large base-model.

Developing map-reading skills: IA. Linear relationships.

Mapping routes between features establishing linear relationships in space: (1) between the school and the "brown apartment house," both on Washington Street; (2) between the "white house" and the service station, both on Hill Street; etc.

Developing map-reading skills: IB. Coordinate relationships.

Moving model vehicles on the base-model, to develop new routes as perpendicular extensions of linear routes, already established on the map.

Constructing a system of coordinate relationships by mapping these routes.

Studying an acetate-overlay map program, which superimposes these routes one by one over the map base.

"Purging" the system of specific place-locations by removing these structures from the board, and placing other structures at specific places on the street grid: for example, at (1) Washington Street and Ashton; or (2) at Fourth Street and Ocean Park Boulevard.

Practicing linear and coordinate mapping skills on follow-up practice maps of the neighborhood.

Establishing the Concept of Scale.

Studying models of this same neighborhood, produced at three levels of decreasing scale.

Observing that the same street pattern, painted on the masonite boards, also appears on each of these smaller boards.

Classifying the model structures by shape and by size (scale), to decide which ones go with which board.

Referring to structures on the large-scale model, in placing the smaller models appropriately on the smaller-scale boards.

Comparing the 4 base-models.

Locating what is alike about all of them; they all represent the same land-surface (area).

Identifying what is different about them: they represent the same total area at different scales.

Arranging in order of decreasing scale. Noting that the smallest board (1" x 1") just matches the scale of the Santa Monica street map available from the City Engineer's Office.

Placing that smallest board on the street map. Comparing the school structure on that board with the symbol of the school on the air photo.

Establishing the Concept of Relative Location.

Locating the school in relation to other known places in the larger community: the local shopping center, the movie theater, the beach, the mountains (visible from their school playground).

Reducing the scale of the entire Santa Monica map, now, to overall size of 1" x 2"; and locating (as specifically as the scale allows) the school on this reduced map.

Studying the terrain model of the greater Los Angeles region.

Locating the reduced-scale map of Santa Monica on this terrain model.

Identifying on this model the mountains visible from the school playground.

Identifying on this model the beach, and all of Santa Monica Bay.

Reaching their own conclusion of what happens as we reduce the scale of a map. (The children may conclude, for example, that as the scale is reduced, more and more area can be represented.)

Comparing the advantages of large-scale and small-scale maps.

Deciding when one would need to use a large scale as compared to a small scale map, and vice versa.

(Note to teachers: This teaching sequence moves rapidly in its extension of spatial concepts. Review and periodic practice will be necessary for most children in subsequent weeks of the semester.)

II. MAJOR ORGANIZING CENTER: INQUIRY INTO THE PHYSICAL GEOGRAPHY OF THE SANTA MONICA AREA.

B. LEARNING OPPORTUNITIES.

Obtaining Information on the Distribution of Major Landforms in the Bay Area.

Taking a field-study trip to one of the taller buildings in the community to visit the observation tower.

Preplanning the study trip by consulting the city map and the terrain model to locate cardinal directions, and features to be observed.

Taking the study trip and locating, from the observation tower, the major features in the landscape.

Santa Monica Mountains
Santa Monica Bay
Palos Verdes Peninsula (if visible)
Catalina Island
Los Angeles lowland
Cultural features occupying the region.

Analysing the features observed on the study trip.

Classifying. (Children, for example, can determine a number of defining characteristics, in order to classify and to subgroup, within classes.)

Determining which features are natural and which are man-made.

Inquiring How These Different Landforms Came to Be.

Acquiring information on the formation of the mountains within the region.

Observing rock samples and fossils obtained from the Santa Monica Mountains.

Learning these fossils of sea life (scallop-shell imprints) were found several hundred feet above sea-level, in Topanga Canyon and in the Malibu region of the Santa Monica Mountains.

Seeking explanation of the inquiry, how did sealife get into the Santa Monica Mountains.

Obtaining data on geographers' explanation: That all of this region was once under the sea and was later raised above sea level.

Suggesting what else ought to be found in the mountains, if this region was once under the sea.

(For example, children might suggest that kelp and other sea life would have decomposed but their imprint might be left in shale; or, they might suggest sand from the ocean floor might be found in the mountains. Encourage divergent responses, and stimulate cause-effect hypotheses.)

Observing samples of sandstone and shale from the mountains. Learning sandstone was once sand, and shale was once mud. Both were deposited on the ocean floor, and, under pressure, cemented together by lime cement.

Determining whether fossils, found in beds of marine sediment (sandstone and shale) are good evidence these mountains were once under the sea.

Learning what other forces have been at work.

Looking at photos of an exposed mountain side in the Santa Mountain Mountains.

Observing the beds of sandstone, shale, and conglomerate rock.

Comparing sandstone and conglomerate rock, composed of large pebbles.

Learning some of these deposits of sandstone, shale and conglomerates are of later origin, and were deposited by rivers, after the region was raised above sealevel.

Learning streams carrying (1) coarse pebbles, (2) sand, and (3) mud deposit their sediment, and these deposits become (1) conglomerate rock, (2) sandstone and (3) shale, when under pressure.

Studying the photo again and observing that these beds of sandstone and shale are not level, but are folded, and some are vertical.

Inquiring how these sediments, once level, came to be folded, warped, and raised vertical.

Suggesting possible ways. (For example, children might suggest earthquakes caused the change.)

Observing a classroom demonstration of the formation of an anticline. (The teacher, using a stiff paper, can demonstrate the up-arching of the paper when force presses inward from both sides (lateral pressure).

Learning the Santa Monica Mountains are the result of such pressure, accompanied by faulting (breaking of the earth's crust).

Learning of effects of erosion on these broken surfaces, and the action of landslides, stream erosion, flash floods, and so on.

Inquiring how the Los Angeles lowlands came to be.

Learning that geographers believe this lowland, a great area extending south of the Santa Monica Mountains, was formed by downward warping--a process opposite to that producing the mountains.

Learning the ocean has flooded into this great lowland on the west, and formed Santa Monica Bay.

Observing a classroom soil-box demonstration, to observe how streams, flowing downward out of mountains, deposit their sediment when they reach grade, and fan out over the valley floor.

Learning all of this lowland is consistently being covered with thin layers of alluvium, washed down by rivers from the mountains. Unlike earlier deposits, however, this alluvium has not been compressed (by great pressure) and cemented into rock. Where exposed, (as, for example, at the palisades along the beach front), this alluvium crumbles, and when wet from rain or ground water, oozes, slides, and sometimes whole slopes give way.

Learning that this entire lowland has further been changed by being raised several times, thus exposing each time a new surface level to the sea.

Walking inland, from the beach, in the area of Washington School, and locating the old beach ridges and lagoons, which presently account for steep slopes in the streets. Learning Lincoln Boulevard occupies the innermost of these old lagoons, caused when the land rose, and the sea receded.

Planning a field-study trip to the Malibu region to observe these landforms and their associated vegetation cover. (An area selected because it has been little changed by man.)

Planning an all-day excursion, for the purpose of acquiring specimens, and photographs of the region.

Studying the terrain model and maps to locate the route of the planned trip.

Viewing air photos of the Malibu region and locating natural features to be seen.

Visiting the coastal strand as the first stopping place.

Identifying features in this place: the ocean, lagoons, the beach, Malibu creek.

Dividing into teams, and acquiring specimens and photos of animal life and vegetation associating with these places on the seaward side of the highway.

Returning as a group and comparing.

Observing, under teacher guidance, how the extended shoreline (a sharply widened beach) "associates" with the mouth of Malibu Creek.

Looking "upstream" and observing the course of the creek.

Recalling how streams carry sediment and deposit that sediment on land to form alluvium.

Learning this beach formation is a "delta," and is being built by stream deposition into the ocean.

Viewing the palisades from this point and noting the wave-cut benches, the result of sea erosion of the shore-line at earlier times. With each uplifting of the land mass, the sea receded, and exposed another wave-cut cliff or bench to view.

Visiting, at the delta, the site of an early Chumash Indian settlement.

Observing the blackened soil of the kitchen midden.

Hypothesizing how the people of this settlement lived, given the resources of this coastal site.

Driving by bus into the Santa Monica Mountains.

Parking on a south-facing windward slope.

Comparing two vegetation associations apparent here: one, an association of riparian (river) vegetation along the stream-bed; and the other, the associated plants of chaparral on the mountain slopes.

Walking to the crest of the divide, and looking down the north-facing slopes. Discovering how much denser, taller, and complex this chaparral is than that observed on the seaward (windward) slope. Discovering, too, how much warmer it is on the wind-free and fog-free north slope.

Gathering samples for return to the classroom. (Labeling, carefully, while still "in the field" and marking the data-maps to record where obtained.)

Continuing by bus to the summit area of the mountain range.

Parking on a level mesa, and gathering to analyze the scene below.

Locating their position with the aid of the terrain model and a map.

Discovering they can see, directly below them, the interior valley (intermontane).

Identifying the river by the thin line of riparian (tree) vegetation along its course.

Photographing the scene for a record of the plant association in the valley below (oak parkland).

Observing the rock outcroppings. Learning these rock formations are a part of the mountain system on which they are standing.

Collecting rock samples: sandstone, shale, conglomerate, and volcanic lava.

Studying one formation of lava rock on the mountain slope, and learning how extensive volcanic formations are found throughout this region.

Learning these rock outcroppings in the valley below indicate an area where the river is narrowly channeled, and where ground water is close to the surface. This reliable water supply, coupled with the acorn-resources of the oak parkland created favorable conditions for a large Indian settlement in this place.

Hypothesizing whether these Indians would have lived lives similar to or different from the Chumash Indians on the coast.

Descending into the valley by bus, to visit ~ pia Park for lunch.

Studying the wooded park as an examp natural "oak parkland" vegetation.

Gathering samples.

Hypothesizing what Indian children and adults could have done, if they lived in this place.

Returning to Santa Monica by way of mountain roads to Topanga Canyon.

Stopping to observe fossils in the rock deposits of an exposed mountain slope.

Descending through Topanga Canyon, and reviewing vegetation associations observed in close juxtaposition: chaparral, riparian, and coastal strand.

Comparing with "introduced" vegetation in the settled area of Santa Monica.

Developing a Classification System for their Vegetation Samples.

Sorting by the areas in which the samples were obtained. Referring to developed photos, taken on the trip, when uncertain.

Grouping by area, and subgrouping within areas.

Choosing criteria for subgrouping plants.

Labeling .

Using a self-instructional teaching program at the Listening Center, designed to reinforce and extend children's understandings of these several vegetation associations: coastal strand, riparian, chaparral, and oak parkland.

Learning the special adaptive characteristics of each.

Learning the relationships between microclimatic zones and modifications in the plant associations (example of north and south slope chaparral variations).

III. MAJOR ORGANIZING CENTER: INQUIRY INTO INDIAN OCCUPANCE OF THIS REGION.

A. INSTRUCTIONAL OBJECTIVES

Children will demonstrate knowledge of the resources and patterns of living of three Indian populations in the extended Los Angeles region: Chumash, Gabrieleno, and Cahuillo.

Children will use the concept of areal association in predicting sites where Indian settlements might have developed, given information concerning vegetation associations and water resources in the extended region.

III. MAJOR ORGANIZING CENTER: INQUIRY INTO INDIAN OCCUPANCE OF THIS REGION.

B. LEARNING OPPORTUNITIES

Inquiring How Indians of the Santa Monica Region Lived (in pre-Columbian Times).

Studying the terrain model, together with their classroom display of vegetation, landform and water associations in the region.

Recalling the delta-site of the Chumash Indians, visited on the study-trip.

Recalling the inland-valley oak parkland settlement, observed on their study trip.

Locating these two settlements, and determining what features "associate" with each.

Rivers, in the case of both settlement.

Oak trees in the oak parkland and in the riparian vegetation association along Malibu Creek.

Coastal strand vegetation and the coastal waters in the case of the delta settlements, only.

Hypothesizing how these Indians might have lived, given the specific resources of these places.

Observing a display of tools and artifacts for information on the technology available to these Indians.

Observing photos and a display (available from the County Museum) of animal life indigenous to these places.

Using these data in predicting possible life-ways of these people.

Consulting classroom resources (project-prepared reading material; and Tohi, A Chumash Indian Boy by Falk).

Contrasting life in the coastal and the inland Chumash settlements.

Dramatizing episodes in Chumash village life through dramatic play.

Simulating daily activities: preparation of acorn mush; shaping of a sandstone bowl; construction of a canoe from driftwood planks and yucca fiber, and calking with asphalt obtained from the region; journeying to Catalina Island to trade for soapstone quarried there and useful for utensils; fishing.

Adding the Indian settlement on Catalina Island to their map. Learning this was a Gabrieleno Indian settlement, and one of the Shoshonean groups, the largest in Southern California.

<u>Inquiring Where Other Indians of the Larger Los Angeles Region Lived.</u>

Summarizing what they know about site-locations of Chumash villages.

Incorporating into their generalization factors of natural resources: fresh water supply, oak trees (for acorns), and access to the ocean (either an ocean-site, or within travel distance of it, in order to procure sea foods from time to time).

Using their generalization in hypothesizing other possible sites for Indian settlements.

Marking their proposed sites by applying small colored masking-tape circles to the terrain model.

Verifying their hypotheses by consulting an acetate-overlay map system, designed to illustrate associated factors in Indian village sites.

Layer I: photo reproduction of the terrian model.

Layer II: rivers of the region, marked in blue.

Layer III: the coastal strand, painted in green.

Layer IV: selected coastal Chumash sites, located in red.

Layer V: selected coastal Gabrieleno sites, located in blue.

Determining what all these sites have in common: coastal strand vegetation, ocean resources, and fresh water, since each was located where a river or stream emptied into the sea.

Verifying their inland Indian sites, by the same acetate-overlay map system.

Layer VI: the oak parkland, a region painted in yellow-brown.

Layer VII: inland Chumash settlements. (In red.)

Layer VIII: inland Gabrieleno settlements (in blue), including the Yang-na (later the site of early Los Angeles).

Determining what these sites have in common, and comparing with the coastal sites.

Contrasting Chumash and Gabrieleno sites. Noting both groups occupied coastal and inland settlements, but their territories were different. (Gabrieleno settlements were south of the San Gabriel and Santa Monica mountain ranges. Chumash were north. Gabrieleno were primarily an inland group; Chumash were primarily a seafaring, coastal group.)

Inquiring How the Gabrieleno Indians Lived.

Deriving hypotheses from their earlier "knowledge-claim."

(Children, e.g., might hypothesize that coastal and inland Gabrieleno settlements might be similar to coastal and inland Chumash settlements, respectively.)

(Children might, on the other hand, modify this inference to suggest Gabrieleno "ways" may have been different from Chumash ways, and modified, therefore, the use they made of similar resources.)

Obtaining data (selective observation).

Learning the coastal Gabrieleno sites were relatively large, prosperous settlements, and active trade centers.

Learning these villagers were fishermen, too, and traded dried fish, shells, steatite (soapstone) utensils, bowls, pipes, and artifacts, and sea-otter skins--probably in exchange for deer hides, acorns, and "chia" seeds, brought by the "inlanders."

Studying the distribution of these settlements, located on rivers which have since changed their course. (A result of the floods of 1824-25, and subsequent channeling of the rivers by Anglo settlers to stabilize their course.) Discovering, e.g., the Porciuncula River (the Los Angeles River) used to empty into Santa Monica Bay, and not into San Pedro Bay, as it does today.

Obtaining data on the activities of the inland Gabrieleno settlements (the more numerous settlements).

Learning the Yang-na settlement was located on the Porciuncula (Los Angeles) River, probably near the present location of Main and Los Angeles Streets.

Comparing the Gabrieleno wickiup with the Chumash communal house, sheltering as many as 4-5 families.

Learning the acorn was the dominant food of the inalnd groups, supplemented with edible roots, bulbs, berries, and nuts.

Learning that the coastal Chumash were the more favored in their diet: sea life, acorns and seeds, and birds and land animals from the mountains permitted a balanced diet.

Learning that the inland Gabrieleno compensated by seasonal hunting, fishing, or trading to obtain what was not locally available. Consequently, they were engaged in more seasonal moving to obtain food than were the coastal Chumash.

<u>Inquiring whether these Indians, alone, occupied the greater Los Angeles region.</u>

Consulting the terrain model, and data on the trans-montane region.

Learning these regions to the north and east of Los Angeles are primarily desert areas.

Inquiring whether any place there would support Indian settlements.

Hypothesizing, for example, that settlements would only be found if a dependable water source were available.

Studying the remaining levels of the acetate-overlay map system for data on the distribution of desert sites.

Layer IX: the desert vegetation association (a region painted in yellow).

Layer X: village sites of the Cahuillo Indians, located at water holes, where wells up to 16 feet in depth were dug.

Learning these settlements were considerably smaller, and less permanent. The Cahuillo moved frequently.

Comparing Gabrieleno and Chumash ways with Cahuillo ways.

Obtaining data on Cahuillo foods: plant foods from the desert, reptiles, insects, and small rodents.

Learning these foods could be supplemented with those available in the higher deserts and lower mountain slopes: pinyon nuts, mountain animals including bighorn mountain sheep, antelope, and deer.

Learning these mountain resources did not support permanent Indian sites, however. They were seasonally obtained by Cahuillo hunters.

Viewing Layer XI of the map system: the mountain regions, painted in brown, with no settlements of a permanent nature.

Learning why: severity of winter snows, presence of bears, against which the Indians had no weapons strong enough to defend themselves. (Learning taboos concerning bears were a part of the culture, and further reinforced Indian avoidance of these regions as a permanent site.)

Learning the Cahuillo, like the Chumash and Gabrieleno Indians, moved about, though they did so to a considerably greater extent:

Viewing Layer X of the map system, showing routes of seasonal migration of all three Indian populations.

Seasonal movements to the ocean for fish.

Seasonal movements into the mountains for game and nuts.

Comparing life-ways of all three groups.

Obtaining data on artifacts, tools, and social customs of the Cahuillo.

Engaging in contrastive analysis, between groups (Chumash-Gabrieleno - Cahuillo).

Summarizing: in what ways the resources of these different regions supported Indian occupance; how Indian ways (culture, outlook, technology) influenced the use these people made of these resources.

<u>Inquiring What Happened to these Indian Settlements</u>.

Learning most of these settlements were long-ago abandoned, and are known today chiefly through local history and through archaeological research.

Learning new settlers came to this region, displaced the Indians, and changed their ways.

IV. MAJOR ORGANIZING CENTER: INQUIRY INTO SPANISH OCCUPANCE OF THIS REGION.

A. INSTRUCTIONAL OBJECTIVES.

Children will demonstrate knowledge of specific changes Spanish occupance (missions, pueblo, and ranchos) brought to the Los Angeles landscape.

Children will demonstrate knowledge of specific changes in Indian culture imposed by Spanish occupance of the region.

Children will formulate refined (and tested) generalizations concerning site-factors in the location of Spanish settlements (missions, pueblo, and ranchos) through contrastive analysis of features "associating" with each.

Children will apply the concept of "sequent occupance" in hypothesizing some relevant characteristics of "Yankee" occupance of this region, following the Mexican period.

IV. MAJOR ORGANIZING CENTER: INQUIRY INTO SPANISH OCCUPANCE OF THIS REGION.

B. LEARNING OPPORTUNITIES.

Inquiring Who These New Settlers were and where They Came From.

Obtaining data on Spanish explorations into this region.

Hearing historical accounts of Spanish explorations from the sea.

Cabrillo's exploration of Santa Monica Bay.

Vizcaino's explorations of San Pedro Bay, Catalina Island, and north to Monterey.

Tracing these journeys on their California map

Hearing the account of Portola's march northward from San Diego, as recorded in Fr. Crespi's diary.

Tracing on the terrain model the course of Portola's march through the Los Angeles lowland, and the campsite on the Porciuncula River, later to become Los Angeles.

Noting the association of features recorded by Crespi: the confluence of two rivers, the signs of flooding, the wooded vegetation of the river, and the associated plants of the valley: grasses, wild vineyards, and rose bushes in bloom.

Noting that Fr. Crespi recommended this place as suitable for a mission, and capable of supporting a large population, because of the richness of the soil for agriculture.

Comparing with factors the Indians considered important: river resources common to both; Indians favored, in addition, acorns and grass seeds; Spanish favored the rich soil for agriculture.

Anticipating possible changes in land-use after the Spanish came to settle. (For example, children might suggest the valley would become converted to agriculture.)

<u>Inquiring Where the Spanish First Settled in this Region.</u>

Learning the first permanent Spanish settlements were missions, established to convert the Indian population.

Hypothesizing where these missions might have been built, in the larger Los Angeles region. (What choices did the padres have?)

Comparing the site of San Gabriel mission, some 20 miles from the site suggested by Portola, and noting factors both sites had in common: river, agricultural lands, proximity to Indian settlements.

<u>Inquiring How Spanish Mission Occupance Changed the Land.</u>

Obtaining data and classifying. (Encourage children's active participation in developing a classification system for a "data retrieval chart" on the Spanish mission period. Source data will include, for example:)

Introduction, by the padres, of new plants to the California land-scape: citrus, olive, and fig trees; wheat; cultivated grapes; and some garden vegetables.

The building of dams and tile conduits to channel river water for irrigation to the cultivated fields.

The mission itself.

The relocation of semi-migratory Indian populations in native rancherias, close by the mission.

Contrasting with the distribution and pattern of Indian settlements.

Summarizing ways in which Indian life was changed, after the mission was built.

Learning Spanish technology and arts: for example, construction of dams, manufacturing tiles and bricks from adobe, building corrals and tending sheep, cultivating and harvesting crops.

Learning Spanish beliefs and a new social system.

<u>Inquiring Where Spanish Settlers Next Occupied This Region</u>.

Learning the Spanish Crown encouraged settlement of California, as a means of holding the land.

Hypothesizing where the first Spanish settlers were likely to come.

Applying earlier learnings as an inference in formulating these hypotheses. (e.g., children might suggest these settlers, also, would want a river-site, on land which could be cultivated).

Obtaining data on the site of early Los Angeles, El Pueblo de Nuestra Senora La Reina de Los Angeles (founded 1781).

Reading, from a transcribed document, the Order of Governor Felipe de Neve for the founding of Los Angeles.

Summarizing the critical site-factors stated in this document: river-site, on land which can be irrigated, and which is slightly elevated and exposed to N-S winds; free of flood dangers; and from which the agricultural lands can be viewed.

Locating the Pueblo.

Noting its proximity to the Mission, important in Spanish culture in the new world.

Noting certain terrain advantages, in addition: the hills, rising abruptly on the west, and providing easy defense for the settlement; the mountain range to the north, providing a constant water source in the rivers flowing southward; grass-covered plains extending twenty miles to the west and south.

Obtaining data on the pueblo.

Studying an early map, sketched in 1786, by Jose Arguello, marking the location of the municipal lands, the "mother ditch," and the house-lots and structures on the plaza.

Assembling a model of historical Los Angeles, constructed to replicate the plaza and its associated structures, as of 1786.

Engaging in dramatic play to reenact some episodes in the lives of these "pobladores."

Obtaining data on the names and conposition of the families, recruited in Sonora, Mexico, to settle Los Angeles.

Dramatizing activities: the journey to Los Angeles; founding the pueblo; digging the "mother ditch," the first communal activity of the settlement; claiming and cultivating the farms; carrying on life in the pueblo.

Beginning a population graph, to record how the city grew.

Establishing the date 1781, the city's founding, and recording 46 for the population at that date.

Establishing, on the time-axis, 1800, 1850, 1900, 1950, and 2000 as major points in time.

Obtaining data on population in Los Angeles in 1800: 315. Judging whether the town was growing rapidly or slowly.

Inquiring Whether Santa Monica (and Malibu) were Growing During this Period.

Learning the growth of the Los Angeles region during this period was largely in the formation of great ranchos, awarded by Spain to those who has served the crown.

Studying the terrain model of the region and hypothesizing where military captains, awarded these ranchos, might have claimed their lands. (If the children had the choice to make, what area would they have claimed?)

Hypothesizing what site factors would be important for a good rancho. (Children, for example, might suggest:)

A river or stream, where cattle could get water.

Grasslands, for feed.

Proximity to the pueblo, or the mission, for agricultural products and social contacts.

Proximity to the sea, for trade.

Proximity to the hills or mountains, for protection.

Etc.

Projecting hypotheses through "claims" to land by marking potential ranchos on the terrain model.

Obtaining data of the first ranchos granted, as a means of testing their hypotheses concerning site-factors.

Consulting written accounts, prepared by the project.

Consulting maps of the early ranchos, to verify the boundaries of the early claims.

Summarizing their findings in a refined generalization concerning site-factors.

Noting, for example, the features of the four ranchos of this early period. (San Rafael, Los Nietos, San Pedro or Dominguez, and San Antonio.)

Comparing, and summarizing what features all held in common: river locations, close to Los Angeles and to the Mission, in grasslands, and--in the case of the southernmost, only--with access to the sea.

Predicting subsequent ranchos development, on the basis of this generalization.

Looking, for example, for new river locations, in grasslands, close to a mission, and with access to the sea.

(Children, for example, might choose to include Santa Monica and Malibu, because of the sea, though neither was proximate to a mission. They might select grasslands in the San Fernando and Simi Valleys, because of proximity to San Fernando Mission, despite mountain barriers to the sea, etc.)

(Encourage an active search, and the incorporation of as many relevant site-factors as possible in their hypothesized locations.)

Obtaining data of the next ranchos to be developed: (Encino, and Simi, in the San Fernando-Simi Valleys; ranchos in the San Gabriel Valley, after the secularization of the missions; and La Brea and Las Cienegas in the central Los Angeles lowlands.)

Refining their generalization, on the basis of these data. (Incorporating, for example, the evidence that interior grasslands, close to the missions were preferred.)

Inquiring how the mission lands became available.

Learning Mexico became an independent nation, following war with Spain, and changed its laws.

Learning all this region now belonged to Mexico.

Inquiring Into the Settlement of the Santa Monica and Malibu Region.

Learning both regions became ranchos at a later time.

Learning that the Rancho Topanga Malibu Sequit was granted to the Tapia family (c 1802); Rancho Boca de Santa Monica, granted to Alvarado and Machado (1827) to include Santa Monica Canyon; and Rancho San Vicente y Santa Monica, granted to Sepulveda (1828) and including most of present-day Santa Monica.

Judging why these coastal areas might have been late in being claimed.

Obtaining data on everyday life on these ranchos.

Learning, from stories and films, of ranching activities, and the special tasks performed by vaqueros during the round-up and matanza.

Learning of smuggling activities on the remote coves and canyons of Malibu rancho, and efforts to control it.

Learning of trade activities with Los Angeles, where products arriving by sea at San Pedro Bay were available in the stores of Main Street.

Inquiring Whether Los Angeles Grew, with the Settlement of the Basin.

Obtaining data of Los Angeles' population by 1850.

Learning the population was now 1610. (770 for the town; 390 for the ranchos and missions.)

Judging whether this was an important increase over population in 1800 (315).

Adding data to their population graph.

Inquiring What Happened to the Ranchos.

Comparing their map of the rancho period with air photos of the city today.

Learning Mexico and the United States fought a war, and all this land was ceded to the United States.

Anticipating what might happen now.

Recalling the Spanish brought new land-use to the region when they acquired the lands earlier held by the Indians.

Hypothesizing some things which might change when the "Yankee-settlers" begin arriving.

V. MAJOR ORGANIZING CENTER: INQUIRY INTO "YANKEE" OCCUPANCE OF THIS REGION.

B. LEARNING OPPORTUNITIES.

Inquiring How the Los Angeles Region Changed After United States Settlers Came to Live Here.

Obtaining data on early changes in Los Angeles City.

Studying the first map of the city, prepared by Lieutenant Ord of the U.S. Army, 1849.

Observing what remained unchanged from pueblo days: the plaza was still the center of the city; the hills and the river still marked its western and eastern boundaries; the residential part of the city was on higher land; the cultivated fields were on lower land, where water from the mother ditch could flow down and irrigate the fields.

Observing that streets followed the fields, (and the Spanish metes and bounds system). They were irregular.

Studying photos of Main Street, Los Angeles by 1875. Observing the street was unpaved, buildings were, in some instances, little more than sheds, wagons and animals provided transportation.

Summarizing all these observations.

(Children might suggest, e.g., that the city changed little in those years; or, that the Spanish features of the little frontier pueblo largly remained unchanged.)

Finding out about life in Los Angeles during this period.

Learning the plaza and the church were still the center of city activity; that the city was still largely Spanish or Mexican in its population and culture.

Learning of urban umprovements that developed as settlers increased in number:

Development of city government: a mayor and city council.

Development of municipal offices: fire, police services, a school, and library.

Building the first bank.

Founding the first newspaper in Spanish and English.

Learning that water was still an important problem for the little city. Learning of efforts to improve the system of ditches which carried water to the city, and the building of a city reservoir at that time.

Learning that trade and transportation were helping the city to grow.

Shops on Main Street sold merchandise brought in by ships that landed at San Pedro Bay.

A young man named Phineas Banning set up business in freight hauling, and built a fleet of wagons for moving freight between Los Angeles, San Pedro, and San Diego.

Because of Banning's busy trade, Los Angeles harbor began to grow.

Comparing With Los Angeles Ten Years Later.

Obtaining data on Los Angeles ten years later. (1885).

Observing a series of comparative photos of Main Street, Los Angeles, in 1885.

Comparing with the photo sequence of 1875.

Buildings were now 2-story, richly ornamented, with balconies, glass windows, and fronted by sidewalks.

Structures included banks, hotels, and municipal buildings, as well as stores.

Street-car tracks ran along Main Street.

Interior views of a general store displayed a great variety of merchandise.

Adding four masonite boards as an extension of their plaza model, and assembling an accurate replica of Main Street in 1885.

Consulting a map from the City's files of that period, to learn the major structures and their location at that time.

Comparing the unchanging plaza at the north end of Main Street, with the numerous changes along this central street of early Los Angeles.

Inquiring Why Los Angeles Changed So Much In Such a Short Time.

Observing a population graph, depicting the population change accompanying the change in landscape along Main Street.

(Data pictorially represented are the following:)

1850:	1,610
1860:	4,385
1870:	5,728
1880:	11,183
1890:	50,395

Judging whether a big change in Los Angeles was underway.

Inquiring what could be its cause.

Hypothesizing. (For example, children might extrapolate from data already known to suggest that harbor trade increased business and the economy, and might have brought more people here.)

Obtaining data on changes simultaneously occurring with this population growth:

The first transcontinental railroad was completed. The Southern Pacific R.R. ran a line to Los Angeles in 1876, and the Santa Fe R.R. completed its line in 1885.

The railroads began a "price war," and sold tickets to California sometimes for as little as one dollar.

Judging what happened when transcontinental travel by rail was rapid and cheap.

<u>Inquiring How the Los Angeles Region Changed After the Railroads Came</u>.

Judging, from population growth and changes on Main Street, Los Angeles became more prosperous, and engaged in more trade with distant markets.

Inquiring what supported all this growth.

Learning the great ranchos had been wiped out through a series of droughts that killed most of the cattle.

Learning that business men and settlers from the East bought the ranchos.

Judging how they might use the land, given the facts that:

(1) American settlers were used to farming, not cattle ranching.

(2) U.S. engineers had technical knowledge for constructing dams and irrigation systems.

(3) Railroads allowed rapid transit of products to markets in the East.

(Children might hypothesize, for example, that agriculture became the dominant land-use in the Los Angeles Basin.)

Obtaining data on the economy of this region.

Learning new plants were imported, and the Los Angeles region became a major producer of citrus fruits, grapes, fruits and vegetables.

Learning that the development of the refrigerated R. R. car and the tin can assured the economic success of California agriculture, since its products now could reach eastern markets without fear of spoiling.

Summarizing the factors which together accounted for change in the growth of Los Angeles: new transportation, markets, and processing methods.

<u>Inquiring How Santa Monica Was changing During This Same Period.</u>

Recalling that Santa Monica had been claimed as two ranchos, and had not started as a pueblo or settlement, as Los Angeles City had.

Learning the Santa Monica and Malibu ranchos suffered from the same droughts that destroyed the vast cattle herds of this region.

Learning, in addition, many of the early Spanish land-titles were not clear, and under the new law (U.S.) land-holdings were lost to the original Spanish families.

Obtaining data on changes.

Learning the Malibu Rancho was bought by a Massachusetts family, who converted it to mixed agriculture and ranching.

Learning the Santa Monica Rancho was bought by Colonel Baker, who planned to build a harbor in Santa Monica Bay, run a railroad line to the ocean, and build a city on his land.

Observing a series of historical photos of Santa Monica, showing the railroad extension to the bay, and the Wharf, which carried the trains out over the water and to a depth where ships could dock and unload.

Predicting what probably happened after the train came to Santa Monica.

Comparing their prediction with data of Santa Monica's growth.

Learning Santa Monica "boomed." Population jumped, and lots sold easily.

Observing historical photos of Santa Monica's early growth.

Real estate auction days in Santa Monica Canyon.

Early structures on Ocean Avenue and Third Street, Santa Monica.

Assembling a model of Third Street, Santa Monica, in 1875.

Locating structures, with the assistance of photos and descriptive records of this period in Santa Monica's history.

Comparing Santa Monica and Los Angeles: cities influenced in their growth pattern by factors of trade and transportation.

Inquiring Why Santa Monica Did Not Grow as Rapidly as Los Angeles.

Studying two population graphs, depicting population change in Los Angeles and in Santa Monica.

Observing that in the case of Los Angeles, population growth was continuous, and, from 1880, extremely rapid, more than doubling every 10 years.

Observing that in the case of Santa Monica, population growth was irregular. (Sharp declines in 1880 and in 1910, with upward, but slower, growth curves following each of those years.)

Determining what places in these graphs need explanation.

(Children should be asked to examine these two graphs, and to see if anything is different between them; if anything is puzzling.)

Searching for an explanation.

(Children might be helped to see that a "good" explanation or "theory" would be one which took all these puzzling events into account, and explained them all.)

Hypothesizing what might have happened which caused these very different patterns in city growth.

(Children might suggest, for example:)

A disaster struck Santa Monica harbor. Los Angeles got a better harbor, etc.

(Be certain they clarify what point in time, on which graph, their hypothesis refers to. Reinforce any efforts to interrelate causes and events, or to express a "theory" of multiple causation. A child might suggest, e.g.,: "It isn't one thing. Probably several things happened like there was a storm in the Santa Monica Harbor, and while that was happening, maybe Los Angeles got more ships, and that helped so the harbor grew more.")

Obtaining data.

Dividing into search teams, and obtaining data on events in Santa Monica and Los Angeles during these critical years.

Consulting selected resources:

Newspapers from that time (reproduced by the community newspaper).

Historical photos.

Readings, produced by the project, from documents.

Classifying data.

Determining relevant categories. (Children should actively participate in organizing their data. They may be helped to develop, for example, a two-way grid or table, and classify both by (1) regions--Los Angeles, and Santa Monica, and (2) events--including, for example, harbor events, railroad events, etc.)

For example:

Events	Los Angeles	Santa Monica
Harbor		
Railroad		
Etc.		

(Or, children might classify by time. Since historical dates are probably less meaningful, be certain children are ready for this approach, if undertaken.)

Contrasting, and determining what events "associate" with periods of growth and decline in Santa Monica and Los Angeles.

Recognizing, for example, that it was not railroads alone that accounted for growth, but railroads associated with a growing harbor.

The coming of the railroads accounted for the great initial population spurt in both Los Angeles and Santa Monica.

Santa Monica's two periods of precipitate population loss coincided with times the Santa Monica wharf and later the "Long Wharf" were torn down, and major harbor activities declined.

Los Angeles' dramatic growth followed the resolution of the "harbor war" in favor of San Pedro (Los Angeles) over Santa Monica Harbor.

Summarizing these findings into an explanation of urban growth.

Comparing with their earlier explanation, derived from factors of railroad expansion, extended markets, and food processing.

Deriving a refined concept of urban development. (This relational concept, involving multiple causation, will be formulated at different levels of complexity by individual children. Elicit their statements of "why these cities grew," and analyse.

Only if children are able to integrate two or more interacting factors in their explanation will they be ready for the succeeding unit.)

VI. MAJOR ORGANIZING CENTER: INQUIRY INTO HOW THE MODERN CITY CAME TO BE.

B. LEARNING OPPORTUNITIES.

Comparing the Modern Extended City (the Larger Urban Region) with the Historical City.

Obtaining data on the modern city, through selected sources.

Viewing air photos of the Los Angeles region.

Studying city maps of the region.

Comparing with the city in 1900.

Observing, for example, that the entire basin is today occupied by urban structures.

Observing, from air photos, how the "urban sea" escapes the mountain barriers to the north, and occupies both the northern and eastern deserts.

Learning that this "megalopolis" is still growing, and is predicted to extend from Santa Barbara on the north to the Mexican border.

Observing what similarities, if any, exist with the historical city.

Viewing a series of comparative photos, historical and today, of selected places in Los Angeles.

Observing places which have remained. For example, the plaza, Main Street, street patterns of the older Spanish city, following the metes-and-bounds system of that time, and certain major arteries tracing what once were rancho boundaries.

Observing how these same places also underwent change.

Studying their land-base model of the old plaza and Main Street, circa 1890.

Viewing a series of historical photos of Main Street, showing change over the years.

Tracing, in one photo sequence, changes in the court-house, which became a bank, then a pawn-shop, and was finally torn down to make way for a new city hall.

Comparing the street pattern before and after construction of the new city hall. Observing that the streets were changed.

Replacing three boards of their model layout with new ones, painted to replicate the present street pattern in this same region.

Removing, from their historical models, those buildings which had been torn down.

Placing models of the new city hall and its associated structures in their place.

Contrasting the new skyline with the old. Observing how the city hall once towered over all the rest.

Comparing with photos of new financial buildings in the redevelopment of Los Angeles today, and noting how major change is again underway.

Comparing with the plaza, which still remains, though the city has encroached upon it, and its historical buildings no longer all remain.

Inquiring How These Massive Changes Have Come To Be.

Using their earlier summary of factors accounting for urban growth to predict some things which must have been occurring over these years.

(For example, children may hypothesize that changes in transportation, trade, and markets, together with harbor development might have been occurring.)

Obtaining data on the "red cars" in Los Angeles (a major factor in the extended pattern of suburban development in the region).

Observing photos of the celebration in Santa Monica the day the "red cars" began service from Los Angeles to the city by the sea.

Studying a map of the red car lines that shortly interconnected places throughout the extended region (by 1920).

Noting how these rail lines brought population growth to communities throughout the extended region: north to Pasadena, Glendale, Burbank, Van Nuys, and San Fernando; east to Monrovia, Azusa, Pomona, Covina, San Bernardino, and Redlands; south to Whittier, Santa Ana, Balboa, Long Beach, and San Pedro; west to the coastal cities.

Comparing, on this map, the built-up inner city (Los Angeles), and its outlying suburbs and neighboring towns.

Comparing this pattern of scattered-urban and agricultural landuse with today's extended urban landscape.

Comparing these rail lines with today's system of highways and freeways throughout the region. Noting how these routes established today's main arteries.

Obtaining data on the coming of the automobile, and its impact on Los Angeles.

Viewing photos of early cars.

Observing the network of streets, freeways, and parking lots which today account for so much of the man-made landscape.

Examining problems auto transportation have solved and have also created in the Los Angeles region.

Summarizing their findings, and judging whether transportation factors are related to the growth of the modern city.

Obtaining data on the growth of industry in Los Angeles.

Learning the aircraft industry, historically centered in Santa Monica, became widely dispersed throughout the Los Angeles region, and supplied many people with income, through jobs.

Learning petroleum, available as a natural resource in this region, was highly prized with the growth of automotive and airplane industries.

Learning oil brought major wealth to this region, and also accounted for a population "boom."

Learning about other industries in the region: motion pictures, rubber, steel, and auto assembly plants.

Comparing these activities with the earlier agricultural occupance of the region.

Learning agriculture was displaced.

Judging some ill-effects of the change: air pollution, and urban sprawl, for example, on valuable agricultural lands.

Inquiring Into Some Ways the Cities are Trying to Cope With Urban Problems.

Obtaining data on reclamation and redevelopment of blighted regions.

Visiting the Ocean Park area in Santa Monica, under urban redevelopment.

Studying the newly developing Santa Monica Mall .s a focus of commercial beautification and civic pride.

Comparing with the redevelopment of the civic and cultural center in Los Angeles.

Visiting this place to see the new mall, and urban reconstruction on the bluffs that once bordered the little pueblo of historic Los Angeles.

Viewing, from these heights, the City Hall, and the new Los Angeles skyline.

Opening inquiry into other urban problems which touch children's lives and are in need of solution.

(For example:)

Preservation and extension of recreational areas.

Improvement of public transportation throughout the region.

Smog control.

APPENDIX E

EXPERIMENTAL CURRICULUM B

Generalizations from Geography

Grade One

GENERALIZATION I (from cultural geography): Man constantly seeks to satisfy his needs for food, clothing, and shelter. In so doing, he attempts to adapt, shape, utilize, and exploit the earth.

Main Idea I: Families in Santa Monica have needs for food, clothing, and shelter, which are met in many ways.

Main Idea II: Workers and community helpers use many resources from the earth so we can live in homes, and meet our needs for food and clothing, and for many community services.

Main Idea III: The land is changed when people work to help us meet our needs.

A. Our city is changed when new houses or apartments are built, and business places are changed.

1. Old houses are sometimes torn down.
2. Big new apartments are built in places that were open land.
3. New stores and other commercial facilities are built. Others are torn down. (Local district. Matl.)

B. The city uses the land to make streets and roads so we can travel.

1. Road workers repair streets.
2. New freeway construction uses the land.

C. The city of Santa Monica has changed the ocean by building a harbor sc families can enjoy a place to fish and to boat.

1. A breakwater holds back the heavy waves....
2. A pier....
3. Dredging....

Grade Two

GENERALIZATION I: Man constantly seeks to satisfy his needs for food, clothing, and shelter and his other wants; in so doing, he attempts to adapt, shape, utilize, and exploit the earth. Some aspects of the natural environment, however, are not significantly altered or utilized by man.

Main Idea I: Man constantly seeks ways to satisfy his need for food.

A. The supermarket serves the neighborhood by marketing produce, dairy products, meat products, bakery goods, and canned and packaged foods.

B. The wholesale market serves as the distributing center for produce supplied by farmers and shippers.

C. Farmers (citrus, wheat, and dairy farmers) supply the city's foods.

D. Fishermen supply the fish markets of the city.

E. Transportation systems are needed to bring all these foods to market.

Main Idea II: In meeting the need for food, man changes the land.

A. Farmers change the land to produce the food we need.

B. The harbor occupies the region at San Pedro Bay, with Fish Harbor and the canning factories among the facilities there.

C. Many transportation systems must be built to move food to the cities. All these systems require resources, and the building of new patterns on the land.

GENERALIZATION II: To exist, man must utilize natural resources. Groups develop ways of adjusting to and controlling the environment in which they exist.

A. Agricultural areas develop where favorable soil, climate and growing season makes good crops possible.

B. Harbor (for incoming transport of fish, bananas to the wholesale market) developed when man found way to build a breakwater and dredge a deep enough channel.

C. Highways and railroads (used for transport of food sources) developed where man leveled or graded the land; and, where mountain passes or the coastal strand allowed access to Santa Monica.

D. Freeways today require the use of basic rock products from the earth; and they represent another adaptation of the land to man's use.

GENERALIZATION III: The processes of production, exchange, distribution, and consumption of goods have a geographic orientation and vary in part with geographic influences. The nature of the organization of economic processes within an area (spatial organization) results from the kinds of resources, the stage of technology, and the sociopolitical attidudes of the population.

Grade Three

GENERALIZATION I: Man constantly seeks to satisfy his needs for food, clothing, and shelter, and his other wants; in so doing, he attempts to adapt, shape, utilize, and exploit the earth. Some aspects of the natural environment, however, are not significantly altered or utilized by man.

Main Idea I: The first American settlers who came to Los Angeles had to satisfy needs, just as we do today.

Main Idea II: In meeting all these needs, the people attempted to adapt, shape, utilize, and exploit the earth.

Main Idea III: Spanish explorers, coming into this region also had to meet needs for food, and for shelter.

Main Idea IV: The Indians who settled in this region also had to satisfy needs for food, clothing, and shelter. In so doing, they used the resources of the earth.

Main Idea V: Santa Monica grew into a city as people worked together to meet their needs for food, clothing, and shelter.

Main Idea VI: In meeting these needs, people of early Santa Monica and Los Angeles changed, utilized, and adapted the earth. Some things they did not change.

Main Idea VII: The city continues to grow and to change as people find still newer ways to satisfy these same needs.

GENERALIZATION II: The significance of the physical features of the earth is determined by man living in his environment. The natural environment may set the broad limits of economic life within a region, but it is man who determines its specific character within the limits of his culture.

Main Idea I: The Santa Monica Bay region has drawn many people over a long period of time. Each culture, however, has used these resources of the bay area in a different way.

Main Idea II: How the city developed was a result of how people chose to use its location on the bay.

GENERALIZATION III: The processes of production, exchange, distribution, and consumption of goods have a geographic orientation and vary in part with geographic influences. The nature of the organization of economic processes within an area (spatial organization) results from the kinds of resources, the stage of technology, and the sociopolitical attitudes of the population.

Main Idea I: Early trade activities of the Chumash and Gabrieleno Indians reflect the location of their villages, and the products they had to exchange.

Main Idea II: Early settlers in Los Angeles depended on a system of transportation to trade the goods they produced (brea, e.g., and sheep's wool) and to obtain new goods for their stores.

Main Idea III: Santa Monica's growth pattern reflected the many changes in transportation which occurred in its period of development.

APPENDIX F

ACHIEVEMENT TEST IN GEOGRAPHY

Level I
Grades 1 - 2

DIRECTIONS FOR ADMINISTRATION

SPECIFIC DIRECTIONS:

(When ready to begin the test, say:)

I have given each of you a book. In this book you will find many pictures. We are going to look at the pictures, and then do something with them. Listen carefully to what I say. Then do what I tell you to do in your book.

(Hold up test book and demonstrate.)

The first page of your book has a place for your name. We will not use this page. Lift the page up, and fold it under. (Demonstrate.)

Now you have Page A in front of you. This is a practice page. We will work this page together.

for PAGE A:

Look at the pictures in the first row on this page. The pictures in this row are a BED, a CHAIR, a CAR, and a BOAT. There is a line across the BOAT.

Now look at the second row of pictures. The pictures in this row are an APPLE, a TREE, a PENCIL, and a BOOK.

Draw a line through the TREE, (pause) -- the TREE.

(Draw a line on the blackboard to demonstrate.)

Your line should look like this.

Look at the third row of pictures. The pictures are a BOOK, a BUILDING, a TREE, and a BALL. Draw a line through the BALL, (pause) -- the BALL.

(Check to see all children have responded correctly.)

Now we are ready to turn the page. On this next page there are some more pictures.

(Check to make sure all children are on page 1.)

On this page we will do the same thing. We will mark one picture on each row. Do your very best. I cannot help you on this page. Listen carefully, and mark a line on the picture you think is best.

<u>for PAGE 1</u>.

<u>Now look at row 1</u>. (Be sure all children are properly located.)

It shows a SUPERMARKET, a RESIDENCE, a CHURCH, a HOSPITAL.

Draw a line on the picture that shows a place where <u>people</u> <u>live</u>.-- where people <u>live</u>.

<u>Now look at row 2</u>.

It shows a REAL ESTATE OFFICE, an APARTMENT, a RESIDENCE, a SCHOOL.

Draw a line on the place where children go to <u>learn</u> -- where children go to <u>learn</u>.

<u>Now look at row 3</u>.

It shows a SUPERMARKET, a DRESS SHOP, a BANK, a FACTORY.

Draw a line on the place where people <u>buy</u> <u>food</u> -- where people <u>buy</u> <u>food</u>.

Turn to page 2.

for PAGE 2

Look at row 1.

It shows a DEPARTMENT STORE, a HOSPITAL, a FACTORY, a BANK.

Draw a line on the picture that shows a place where people buy many kinds of goods -- where people buy many kinds of goods.

Look at row 2.

It shows a SUPERMARKET, a DEPARTMENT STORE, a HOSPITAL, a BANK.

Draw a line on the place where people save money and make loans -- where people save money and make loans.

Look at row 3.

It shows a HOSPITAL, a CHURCH, a RESIDENCE, an APARTMENT.

Draw a line on the place where sick people are cared for by nurses and doctors -- where sick people are cared for by nurses and doctors.

for PAGE 3

Look at row 1.

It shows a MAINTENANCE YARD, a FACTORY, a POLE YARD, a SUPERMARKET.

Draw a line on the place where workers learn a new job -- where workers learn a new job.

Look at row 2.

It shows a FACTORY, a MAINTENANCE YARD, a RAILROAD SIDING, a POLE YARD.

Draw a line on the place where people work to keep the city clean -- where people work to keep the city clean.

STOP. This is the end of PART I.

(Give children a chance to stand up and stretch, if needed.)

for PAGE 4

Now we will turn to the next page. We will do the same thing on page 4. (Check to make sure all children are properly located on page 4.)

Look at row 1.

It shows a CHURCH, a HOUSE, a TRIPLEX, an APARTMENT.

Draw a line on the one-family residence -- the one-family residence.

Look at row 2.

It shows a HOSPITAL, an APARTMENT, a HOUSE, a SCHOOL.

Draw a line on the many-families residence -- the many-families residence.

Look at row 3.

It shows an APARTMENT, a RAILROAD SIDING, a SUPERMARKET, a FACTORY.

Draw a line on the commercial place -- the commercial place.

for PAGE 5

Look at row 1.

It shows a SCHOOL, a HOUSE, a REAL ESTATE OFFICE, a FACTORY.

Draw a line on the place in the industrial region -- in the industrial region.

Look at row 2.

It shows a SUPERMARKET, a HOSPITAL, a DRESS SHOP, a REAL ESTATE OFFICE.

Draw a line on the place in the core of the Central Business District -- in the core of the Central Business District.

Look at row 3.

It shows a HOTEL, a DRESS SHOP, an APARTMENT, a FACTORY.

Draw a line on the place in the outside area of the Central Business District -- in the outside area of the Central Business District.

for PAGE 6

Look at row 1.

It shows a RAILROAD YARD, a BAY, a RESIDENCE, a CHURCH.

Draw a line on the recreational place -- the recreational place.

Look at row 2.

Draw a line on the harbor -- the harbor.

STOP. This is the end of Part II.

(Children may be given a chance to stand up and stretch, if needed.)

for PAGE 7

On this page you will find pictures of some different kinds of places.
On each row I will tell you to draw a line on one kind of place.
Do the best you can. If you think you know the place, be sure to draw a line on that picture.

Look at row 1. Draw a line on the picture that shows a bluff. a bluff.

Look at row 2. Draw a line on the picture that shows a delta. a delta.

Look at row 3. Draw a line on the picture that shows a mesa. a mesa. (pronounced may-sa)

for PAGE 8

Look at row 1. Draw a line on the picture that shows a valley. a valley.

Look at row 2. Draw a line on the picture that shows a mountain. a mountain.

Look at row 3. Draw a line on the picture that shows a canyon. a canyon.

for PAGE 9

Look at row 1. Draw a line on the picture that shows a coastal strand. a coastal strand.

Look at row 2. Draw a line on the picture that shows an island. an island.

STOP. (End of Part III.)

for PAGE 10

On this page you will find pictures of different kinds of places. These are the kinds of pictures that are used on maps.

On each row, I will tell you to draw a line on one place. Do the best you can. If you think you know the place, be sure to draw a line on that picture.

Look at row 1. Draw a line on the one-family house.

Look at row 2. Draw a line on the many-families apartment.

Look at row 3. Draw a line on the supermarket.

for PAGE 11

Turn to the next page. (Be sure children are properly located.)

Look at row 1. Draw a line on the gasoline station.

Look at row 2. Draw a line on the store.

Look at row 3. Draw a line on the factory.

for PAGE 12

Look at row 1. Draw a line on the building you would find in a neighborhood commercial center -- in a neighborhood commercial center.

Look at row 2. Draw a line on the building you would find in a many-families residential region -- in a many-families residential region.

Look at row 3. Draw a line on the building you would find in an industrial region -- in an industrial region.

for PAGE 13

Look at row 1. Draw a line on the building you would find in the Central Business District -- in the Central Business District.

Look at row 2. Draw a line on the building you would find in a one-family residential neighborhood -- in a one-family residential neighborhood.

Look at row 3. Draw a line on the picture that shows a place for parking cars -- a place for parking cars.

ACHIEVEMENT TEST IN GEOGRAPHY

Level II
Grades 1 - 2

DIRECTIONS FOR ADMINISTRATION

SPECIFIC DIRECTIONS:

(When ready to begin the test, say:)

This is another book, with many pictures, and some maps. We will do many interesting things in this book. We are going to look at the pictures, and then do something with them. Listen carefully to what I say, and then do what I tell you to do in your book.

Hold up test book and illustrate:

This first page has a place for your name. We will turn that page under. Do that now.

Everyone should be on Page A. Do you have Page A? Sit ready when you have Page A in front of you. We will look at this page together.

for PAGE A

Look at the top row of pictures. In that row, there are a dog, a chair, a puppy, and a carpet sweeper. Can you tell which two go together? (Pause.) The dog and the puppy go together. You show that the dog and puppy go together by drawing a line on each of them. In this row you draw a line on the dog and you draw a line on the puppy. They are the two that go together. There should be two lines in that row.

(Check to see that each child has made two separate lines, marking the two pictures.)

Now look at row 2. Which two pictures in this row go together? (Pause.) The boy and the girl go together. Draw a line on the boy and a line on the girl. (Check to see that all understand the directions.)

Now we will do some more rows in this same way. Do the best you can. Listen carefully to what I say, and then draw the two lines.

Now look at row 3. This row shows a SUPERMARKET, an APARTMENT, a RESIDENCE, a FACTORY. Draw a line on the two pictures that go together. (Give no help on this item.)

for PAGE B

Look at row 1. This row shows a SUPERMARKET, a RESIDENCE, a DRUG STORE, a DRESS SHOP.

Two of these pictures show places that belong in the same neighborhood.

Draw a line on the two pictures that belong in the same neighborhood.

Look at row 2. This row shows a HOSPITAL, a DEPARTMENT STORE, a BANK, a HOTEL.

Two of these pictures show places that belong in the same neighborhood.

Draw a line on the two pictures that belong in the same neighborhood.

Look at row 3. This row shows a MAINTENANCE YARD, a DRUG STORE, an APARTMENT HOUSE, a FACTORY.

Two of these pictures show places that belong in the same neighborhood.

Draw a line on the two pictures that belong in the same neighborhood.

for PAGE C

Look at row 1. Two of these pictures go together. They both show jobs that must be done to keep the city clean.

Draw a line on the two pictures that show two jobs that must be done to keep the city clean.

Look at row 2. Two of these pictures go together. They show two jobs that must be done so that buildings get built.

Draw a line on the two pictures that show two jobs that must be done so that buildings get built.

Look at row 3. Two of these pictures go together. They show two services in the neighborhood where mother gets food for her family.

Draw a line on the two pictures that show two neighborhood services where mother gets food for her family.

for PAGE D

Look at row 1. Two of these pictures go together. They both show two things that must happen before Mr. Brown has furniture to sell in his store.

Draw a line on the two pictures that show two things that happen before Mr. Brown has furniture to sell in his store.

Look at row 2. Two of these pictures go together. They show two things that must be done before the brick wall is built.

Draw a line on two pictures that show two things that must happen before the brick wall gets built.

Look at row 3. Two of these pictures go together. They show two things that must be done before the family can eat a picnic lunch.

Draw a line on two pictures that show two things that must be done before the family can eat a picnic lunch.

for PAGE E - F

Now we are going to do something different. In this game you must be a detective. Do you know what that is? A detective is someone who hunts for something that is missing, or hidden, or very secret.

Look at Page E. Find Picture 1. (Check to see that every-one is on place.)

Something is wrong in Picture 1. Something is out of place.

Find what is in the wrong place. Then take your crayon and make a very neat line on the thing that is out of place.

Find Picture 2. Are you a good detective? Can you find the thing that is out of place in Picture 2?

Take your crayon and draw a line through the thing that is out of place in Picture 2. Then look this way.

Now turn to Page F. Find Picture 3. This is a different kind of neighborhood. Something is out of place in Picture 3.

Look at the picture carefully. See if you can find something that is out of place in Picture 3. Draw a line on the thing that is out of place. Then look this way.

Now find Picture 4. Find something that is out of place in Picture 4.

Draw a very neat line on the thing that is out of place in Picture 4. (Be sure your line is very neat. It should only mark out one thing.)

STOP. This is the end of Part I of this book. (Give children a moment to stretch, if necessary.)

for PAGE G

Find Page G. This page shows a map of a neighborhood.

We are going to make some new places on this map. You will need your crayons for this job. Find a green, orange, brown, and red crayon. Set them in front of you. Then sit ready for the first job.

1. Mr. Green is building a new apartment house. Find the best place for Mr. Green to build his new apartment house. Mark the place on your map with a small green X. (Demonstrate on board: X)

2. Mr. Orange is going to build a new gasoline station. Find the best place for Mr. Orange to build his new gasoline station. Mark the place on your map with a small orange X.

3. Mr. Brown is going to start a new supermarket. Find the best place for Mr. Brown's new supermarket. Mark the place on your map with a small brown X.

4. Mr. Red wants to move his business into this neighborhood. He wants to rent a good building for his banking business. Find the best building for Mr. Red to rent for his ban... You can pretend that he can rent any building he wants to. Mark the building Mr. Red will rent with a small red X.

for PAGE H

For this next page we must have several things. Listen carefully to these directions.

1. Fold back your book so that Page H is in front of you. Page H has five lines on it. (Check.)

2. Place your crayon box in front of you so you can find your crayons easily.

3. Make enough room for this big map (Map I) that I am going to pass out now. This map has some colored lines on it. The lines stand for trips that people take in the neighborhood. You can look at the maps while I pass them out. But do not make any marks on the maps. (Be sure children understand that answers will go into the answer books, not on the maps.)

Listen carefully now. Look at your map. Find the red trip. Run your finger along the red trip. (Check to be sure all children understand the meaning of "trip.") Now find the blue trip. (Same process.) Now find the brown trip. Now find the orange trip. Now find the purple trip.

I am going to read some stories. Listen carefully to the story. See if you can tell which trip the person takes. If the story tells about the red trip, you will color a red line in your answer book. If the story tells about the blue trip, you will color a blue line in your answer book.

Here is Story 1. Listen to the story. Then be ready to color a line next to number 1 on your answer page.

1. Mrs. Smith lives in the green house. Can you find it? She wants to buy groceries for dinner. Which trip will Mrs. Smith take?

   If you think she takes the red trip, color line 1 red.
   If you think she takes the blue trip, color line 1 blue.
   If you think she takes the brown trip, color line 1 brown.
   If you think she takes the orange trip, color line 1 orange.
   If you think she takes the purple trip, color line 1 purple.

2. Mr. Jones builds new houses. He is building many new houses on A Street. Find A Street. He needs lumber and sand and gravel to build these homes. Which trip will the lumber and sand and gravel trucks take? the red trip? the blue trip? the orange trip? the brown trip? the purple trip?

   Color your answer on line 2.

3. Mr. Billings owns the Billings Department Store in the Central Business District. He has just ordered some new kitchen stoves from the manufacturer. As soon as they arrive at his store, Mr. Billings will load one onto a truck and deliver it to Mrs. Smith's house.

   Which trip will the stove take, from Mr. Billings' store in the Central Business District to Mrs. Smith's house? the red trip? the blue trip? the brown trip? the orange trip? the purple trip? Color your answer on line 3.

4. Tommy needs new shoes. He can't buy them in the neighborhood stores. What trip will Tommy have to take with Mother?

Color your answer on line 4.

5. New telephones are being put into the new mall in the Central Business District. Mike, the telephone repair man, begins his trip at the telephone pole yard where he loads up his truck with new phones. Then he drives to the mall in the Central Business District. Which trip does he take? Color your answer on line 5.

ACHIEVEMENT TEST IN GEOGRAPHY

Level III

Grades 1 - 2

DIRECTIONS FOR ADMINISTRATION

PART I

Specific Directions

for PAGE 1

(When ready to begin the test, say:)

I have given you a map (Map II) and an answer book. Open your answer book to page 1. (Check to see the child has properly opened to page 1.) Now look at your map.

This map shows a neighborhood that is going to change. A new freeway will soon be built through this neighborhood. The brown lines mark the freeway. Run your finger along the brown lines. The brown arrows mark the ramps where cars will get on and off the freeway. Point to the brown arrows.

Four streets are marked on this map. Find red street. Find blue street. Find orange street. Find green street.

Now we will begin. Listen carefully to what I say. Then do what I tell you to do.

1. The men who build the freeway will need sand and gravel and cement. Find the street where cement transit mixers will drive every day on their way to the freeway. Is it red street? Is it blue street? Is it orange street? Is it green street? How will the cement trucks go? Color the answer on line 1 of your answer sheet.

2. After the freeway is finished, one street will be much busier than it is now. It will have more cars. Which street will be much busier? Red Street? Blue Street? Orange Street? Green Street? Color the answer on line 2.

3. After the freeway is finished, one street will probably not be as busy as it is now. It will not have as many cars. Which street will not be so busy? Color the answer on line 3.

4. After the freeway is finished, many more people will come into the Central Business District to shop. One street will be a good route from the freeway to the Central Business District parking lot. Which street will many shoppers take when they drive from the freeway to a good place to park? Color the answer on line 4.

for PAGE 2

5. After the freeway is built, many new people will drive to this city to shop in the Central Business District. Then the Central Business District will change.

   Look at page 2 in your book. There are 4 pictures on that page.

      Picture 1 says the Central Business District will have more parking lots after the freeway comes.

      Picture 2 says the parking lots will have to be torn up, and new buildings built in their place.

      Picture 3 says Street A will be widened in the Central Business District.

      Picture 4 says new stores will be built on B Street.

   Draw a circle around two pictures that show two ways you think the Central Business District will change after the freeway is built. You should have two circles on page 2.

for PAGE 3

6. Turn to Page 3. It has a big picture on it. It has four small pictures on it.

   I am going to tell you a story. Then I will ask you to mark two pictures. Listen to what I say. Then do what I ask.

The picture shows a neighborhood that is changing. Old houses are being torn down. New buildings are being built in their place.

When new apartments are built in a neighborhood, something else often happens, too. The small pictures show some things that might happen.

Picture 1 says old stores will be torn down.

Picture 2 says new stores will be built.

Picture 3 says new houses will be built.

Picture 4 says new places for parking will be found.

Draw a circle around the two pictures that show 2 things that will happen together in this neighborhood now.

You should have two circles on this page.

for PAGE 4

7. This picture shows a neighborhood that is changing. Very soon a new freeway will be built in this neighborhood. Then some other things will change, too.

The small pictures show some things that might happen when the new freeway is built.

Picture 1 says more houses will be built in this neighborhood.

Picture 2 says there will not be as many houses in this neighborhood. There will be fewer houses.

Picture 3 says there will not be as many stores in this neighborhood. There will be fewer stores.

Picture 4 says there will be a new commercial center in this neighborhood.

Draw a circle around the two pictures that show 2 things that will both happen together when the freeway is built.

You should have two circles on this page.

for PAGE 5

8. The big picture shows two piers. Pier A and Pier B. Find Pier A. Find Pier B. Find the ocean.

   There is a breakwater by Pier A. There is no breakwater by Pier B.

   The city wants to build a new breakwater for Pier B.

   The small pictures show some things that might happen if Pier B gets a new breakwater.

   Picture 1 says boats can moor by Pier B if it gets a breakwater.

   Picture 2 says big waves will come in to shore if Pier B gets a breakwater.

   Picture 3 says the shore will change, and the beach will get wider if Pier B get a breakwater.

   Picture 4 says the shore will change, and the beach will get narrower if Pier B gets a breakwater.

   Draw a circle around the two pictures that show 2 things that will both happen together in this place if Pier B gets a breakwater.

   You should have two circles on this page.

for PAGE 6

Pass out yellow air photos. Have children turn the acetate layer back, so they can see the photo clearly.

Have children turn to page 6 in their books. Have crayons ready.

9. Bring the acetate sheet down. Find the place that is marked with a red circle. Look at that place carefully.

   There used to be a house in this place. It was torn down.

What do you think will be built on this place very soon? Look at row 9. It has 4 pictures.

Picture 1 says a house will be built here.
Picture 2 says an apartment will be built here.
Picture 3 says a store will be built here.
Picture 4 says a school will be built here.

Draw a circle around the one picture that you think is the best answer.

You should have one circle on row 9.

10. Now we will answer question 10 in your book. Listen to my question. Do not mark your book until you have heard the whole question.

Is this neighborhood a place where:

1. Many new people are moving in all the time? Picture 1 says many new people are moving in.

2. Many people are leaving all the time? Picture 2 says many people are leaving.

3. Everything is staying just the same? Picture 3 says everything is staying just the same.

Now draw your circle.

You should have one circle on row 10.

11. Find the green place on the photo.

This is a place where the land is being cleared. Soon a new building will be built here.

What do you think will be the best building to build here? Look at row 11 on your page.

Picture 1 says a house will be best.
Picture 2 says an apartment will be best.
Picture 3 says a gasoline station will be best.
Picture 4 says a big supermarket will be best.

Draw a circle around the one best picture. Choose the best building to build on the green place.

for PAGE 7

Pass out green air photo set, with acetate attached and brown freeway route marked.

Say:

On page 7 we are going to play a game called "Change." Look at the air photo. This is a place that is going to change. The brown place shows where a new freeway is going to go.

12. Look at row 12 in your book. This row shows some things that might happen when this freeway is built.

Picture 1 says there will be many more houses in the neighborhood. Look back at the air photo. Do you think that is the right answer?

Picture 2 says there will be not as many houses after the freeway is built. Look back at the air photo. Do you think that is the right answer?

Picture 3 says there will be no houses at all in this neighborhood.

Choose one picture that you think is best. Draw a circle around the picture that gives the best answer. (Repeat the question if needed.)

13. The cars will get on and off the freeway at the ramps that are marked with brown arrows. When these ramps are built for the cars to get on and off the freeway, what will happen?

Picture 1 says there will be much more traffic (many more cars) on Red Street. (Point out Red Street--marked with red crayon.)

Picture 2 says there will be much less traffic (there will not be as many cars) on Red Street.

Picture 3 says there will be the same number of cars on Red Street as there are now.

Choose the best answer. Draw a circle around that picture on row 13.

14. What will happen to Green Boulevard? (Point out Green Boulevard, marked with green crayon on the acetate.)

Picture 1 says there will be more cars on Green Boulevard after the freeway is built.

Picture 2 says there will be fewer cars on Green Boulevard after the freeway is built.

Picture 3 says there will be the same number of cars on Green Boulevard after the freeway is built as there are now.

Choose the best answer. Draw a circle around that picture on row 14.

PART II: REGIONAL ANALYSIS

PASS OUT BROWN AIR PHOTO, with separate, removable sheet of acetate.

Have children place name in lower right hand corner.

Say:

15. Draw a green line all around the place that is mostly one-family houses. Draw your line so that almost all the one-family houses are inside the line.

16. Draw a red line all around the place that is mostly stores. Draw your line so that all the commercial place is inside the red line.

17. Draw a brown line all around the place that is mostly factories. Draw your line so that all the industrial place is inside the brown line.

18. Mr. Green wants to build a new gasoline station. Put a green X on a place that would be a good place for Mr. Green's gasoline station.

19. Mr. Brown wants to build a new supermarket where he will have lots of business, and where many people will come to shop. Put a brown X on a good place for a new supermarket.

20. The city wants to build a new school for boys and girls. Put a red X on a good place for a new school.

Pass out RED AIR PHOTO, with separate, removable sheet of acetate. Pass out acetate markers. Write child's name in lower right hand corner.

Say:

This is an air photo of the Central Business District of a city.

21. Draw a red line all around the central core of the Central Business District.

22. Draw a green line all around the part of the Central Business District where you would find mostly banks and large department stores.

23. Draw a blue line all around the part of the Central Business District where you would find mostly hotels and restaurants.

24. Draw a brown line all around a part of the Central Business District where you would find large parking lots for people who come to the Central Business District to shop.

<u>GRADE ONE STOPS HERE</u>.

<u>PART III: REGIONAL ANALYSIS</u>

(Grade Two Only)

<u>for PAGE 8</u>

Distribute Map III, the regional map.

Say:

This is a map of a region we have not studied. Look carefully at the map. There are places marked on it. Find place 1. Find place 2. There are a number of places marked.

Now look at page 8 in your answer book. This is where you will mark your answers. We will mark one answer together.

Look at row A on page 8. It has 4 numbers on it.

Number 1; number 4; number 5; number 8. One of these numbers shows the ocean. Look at your map. Find the ocean. Is number 1 ocean? Is number 4 ocean? Is number 5 ocean? Is number 8 ocean? Choose the number that marks the ocean. Draw a circle around that number on row A.

Did you mark number 1? That is correct. Number 1 on your map is ocean. (Give assistance if instructions are not understood.)

Now we will begin. I cannot help you now. Do the best you can.

25. Find row 25. It has 4 numbers on it. One of those numbers shows the best place to find good deposits of sand and gravel. Choose the best place for mining sand and gravel for freeway construction. Mark that number on row 25 by drawing a circle around it.

26. The freeway will need cement. Find row 26. It has 4 numbers on it. One of those numbers marks the best place where cement could be produced. Circle that number on line 26.

27. Cement, sand, and gravel must be made into concrete for the freeway. Look at row 27. It has 4 numbers on it. One of those numbers marks a good place where a mix plant could be located. Circle that number on line 27.

28. A new freeway will soon connect City A, City C, and City D. Find City A, City C, and City D. This freeway will cause the region to change. Houses and commercial neighborhoods will be built in a place where there is no city now. Question 28 asks you to choose the place that will grow. Is it the place between City A and City C? Is it the place between City B and City D? Is it the place between City D and Place 4? Choose the place that will grow. Mark an X by the correct answer.

29. Look at row 29. It has 4 numbers on it. Choose the best place for the new fish cannery.

30. The Greenwood Lumber Company plans to build a new lumber yard to handle its lumber shipments in this region. It wants to find a place where it can move lumber in from its forests in the north, and then truck the lumber out when customers buy it. Look at row 30. It has 4 numbers on it. Find the best place for the Greenwood Lumber Company to build its new lumber yard. Circle that number on line 30.

31. The Lemon and Orange Company wants to plant some new orchards. It wants a place where the weather is mild and where there is a good supply of water for irrigation. Line 31 has 4 numbers on it. Choose the best place for the citrus orchard. Circle that number on line 31.

32. The Lemon and Orange Company wants to build a new plant to pack lemons and oranges for the markets in all these cities. Line 32 has 4 numbers on it. Choose the best place for the new citrus packing plant. Circle that number on line 32.

33. Supermarkets in D City are having a sale on fresh fish. Use your purple crayon. Draw a purple line on your map to show how the fish reaches the supermarkets in City D.

34. Lumber yards in City A are having a sale on a new shipment of lumber. Use your red crayon. Draw a red line on your map to show how the lumber reaches the lumber yards in City A.

35. There are four cities on your map. City A. City B. City C. City D. One of these cities is a busy industrial city. Mark the letter of that city on line 35 of your book. If you think City A is a busy industrial city, circle the A on line 35. If you think City B is a busy industrial city, circle the B on line 35. If you think City C is a busy industrial city, circle the C. If you think City D is a busy industrial city, circle the D. Circle one city on line 35.

36. One of these cities probably has a good recreational harbor. Mark the city that has a good recreational harbor on line 36. Circle City A or B or C or D on line 36. Circle one city on line 36.

37. One of these cities probably has a busy industrial harbor. Circle that city on line 37 of your book.

38. One of these cities probably has fish canneries and cans fish for sale in supermarkets in many parts of the country. Circle the city that probably has fish canneries on line 38 of your book.

39. One of these cities probably has a cement plant and produces cement for construction of roads and buildings. Circle the city that probably has a large cement plant on line 39 of your book.

40. One of these cities is probably not an industrial city. It probably is mostly a residential city. Circle that city on line 40 of your book.

41. One of these cities probably has a water shortage, and must get its water by digging wells or bringing water in from other regions. Circle that city on line 4 of your book.

42. One of these cities probably can supply most of its own water needs. It has a good supply of fresh water for the people who live in that city. Circle that city on line 42 of your book.

ACHIEVEMENT TEST IN GEOGRAPHY

Level I

Grade 3

DIRECTIONS FOR ADMINISTRATION

Specific Directions

Distribute test booklet I. Ask children to write name, and to fill in date, school, grade, and teacher's name.

Say: Turn to page 1. On this page there are three rows of pictures. Each row has four pictures. Listen to the question. Then mark the one picture that answers the question.

for PAGE 1

Now look at row 1. (Be sure all children are properly located.)

It shows a SUPERMARKET, a RESIDENCE, a CHURCH, a HOSPITAL.

Draw a line on the picture that shows a place which would be built in a residential neighborhood.

Now look at row 2.

It shows a REAL ESTATE OFFICE, an APARTMENT, a RESIDENCE, a SCHOOL.

Draw a line on the place which would be built in a neighborhood commercial center.

Now look at row 3.

It shows a SUPERMARKET, a DRESS SHOP, a BANK, a FACTORY.

Draw a line on the place which would be built in an industrial neighborhood.

Turn to page 2.

for PAGE 2

Look at row 1.

It shows a DEPARTMENT STORE, a HOSPITAL, a FACTORY, a BANK.

Draw a line on the picture that shows a place which would be built in a Central Business District.

Look at row 2.

It shows a SUPERMARKET, a DEPARTMENT STORE, a HOSPITAL, a BANK.

Draw a line on the place which would be built in a growing financial center.

Look at row 3.

It shows a HOSPITAL, a CHURCH, a RESIDENCE, an APARTMENT.

Draw a line on the place which would be built to meet the religious needs of a city.

for PAGE 3

Look at row 1.

It shows a MAINTENANCE YARD, a FACTORY, a POLE YARD, a SUPERMARKET.

Draw a line on the place which would be built to service a city's needs for telephone communication.

Look at row 2.

It shows a FACTORY, a MAINTENANCE YARD, a RAILROAD SIDING, a POLE YARD.

Draw a line on the place which would be built to service a city's needs for rubbish collection.

for PAGE 4

Look at row 1.

It shows a CHURCH, a HOUSE, a TRIPLEX, an APARTMENT.

Draw a line on the one-family residence--the one-family residence.

Look at row 2.

It shows a HOSPITAL, an APARTMENT, a HOUSE, a SCHOOL.

Draw a line on the many-families residence--the many-families residence.

Look at row 3.

It shows an APARTMENT, a RAILROAD SIDING, a SUPERMARKET, a FACTORY.

Draw a line on the commercial place--the commercial place.

for PAGE 5

Look at row 1.

It shows a SCHOOL, a HOUSE, a REAL ESTATE OFFICE, a FACTORY.

Draw a line on the place in the industrial region--in the industrial region.

Look at row 2.

It shows a SUPERMARKET, a HOSPITAL, a DRESS SHOP, a REAL ESTATE OFFICE.

Draw a line on the place in the core of the Central Business District--in the core of the Central Business District.

Look at row 3.

It shows a HOTEL, a DRESS SHOP, an APARTMENT, a FACTORY.

Draw a line on the place in the outside area of the Central Business District--in the outside area of the Central Business District.

for PAGE 6

Look at row 1.

It shows a RAILROAD YARD, a BAY, a RESIDENCE, a CHURCH.

Draw a line on the recreational place--the recreational place.

Look at row 2.

Draw a line on the harbor--the harbor.

STOP. This is the end of Part I.
(Children may be given chance to stand up and stetch, if needed.)

for PAGE 7

On this page you will find pictures of some different kinds of places. On each row I will tell you to draw a line on one kind of place. Do the best you can. If you think you know the place, be sure to draw a line on that picture.

Look at row 1.

Draw a line on the picture that shows a bluff. a bluff.

Look at row 2.

Draw a line on the picture that shows a delta. a delta.

Look at row 3.

Draw a line on the picture that shows a mesa. a mesa.

for PAGE 8

Look at row 1.

Draw a line on the picture that shows a valley. a valley.

Look at row 2.

Draw a line on the picture that shows a mountain. a mountain.

Look at row 3.

Draw a line on the picture that shows a canyon. a canyon.

for PAGE 9

Look at row 1.

Draw a line on the picture that shows a coastal strand. (repeat)

Look at row 2.

Draw a line on the picture that shows an island. an island.

for PAGE 10

Distribute Map I (regional contour map of an hypothetical region).

Say:

Look carefully at this map. It shows a region near the ocean, where rivers and mountains are found. The mountains are found where the contour lines (these curved lines) are drawn. They show how high the land is. The arrows (point to them) show the direction the wind blows.

Seven places are marked on this map. Find place 1. Place 2. Place 3. (etc. to place 7).

1. Now look at page 10 in your answer book. Question 1 tells you to find a place on your map that is a sheltered valley. You have four answers to choose from. Your four answers are written on line 1. They say place 1, place 3, place 4, and place 6. Has everyone found line 1? (Be sure all children know where the choices are located.)

Choose the one best answer. Is place 1 a sheltered valley? Look at your map and see. Is place 3 a sheltered valley? Is place 4 a sheltered valley? Is place 6 a sheltered valley? look at your map. Choose the one best answer. Circle that number on line 1.

2. Question 2 asks you to find a delta. You have 4 answers to choose from. Is place 1 a delta? Is place 2 a delta? Is place 4 a delta? Is place 7 a delta? Choose the one best answer. Look carefully at your map before you decide. Then circle the one best answer on line 2.

3. Now look at line 3. Find the place on a bay. Is place 1 the place on a bay? Is place 2 the place on a bay? Is place 3 the place on a bay? Is place 7 a place on a bay? Choose the one best answer. Circle that answer on line 3.

4. Now look at line 4. Find a place on a river where there is flooding each year during the rainy months. Is it place 2? place 4? place 5? place 7? I will repeat the question. (Repeat) Choose the one best answer on line 4. Circle it.

5. Now look at line 5. Find a place that is probably the lowest elevation on the map. Is it place 1? place 2? place 3? place 4? Circle the number of the place that is the lowest elevation on the map.

6. Now look at line 6. Find a place that is the highest elevation on the map. Is it place 1? 3? 4? 5? Circle the number of the place that is the highest elevation on the map.

7. Now look at line 7. Find a place that is an alluvial valley. Is it place 2? place 3? place 4? place 6? Circle the one best answer on line 7.

8. Now look at line 8. Find a place that is probably marshy with surface water and lagoons. Is it place 1? place 2? place 4? place 7? Circle the one best answer on line 8.

ACHIEVEMENT TEST IN GEOGRAPHY

Level II

Grade 3

DIRECTIONS FOR ADMINISTRATION

Specific Directions

for PAGE 1

Distribute Regional Map I. (Contour map of hypothetical region with land elevations, wind directions, and 7 place locations marked.)

Say:

Open your answer booklet to page 1. Write your name on that page. You will mark your answers on this page. Each question has four numbers. They are places on your map. You will choose the best answer and draw a circle around it.

Think back to a time when Indians such as the Gabrieleno or the Chumash might have lived in this region. Listen to the question. Then mark your answer by circling the one best number.

1. Which place on the map would have been a good one for Indians who lived mainly on shell fish? Was it place 2, place 4, place 5, or place 7? I will repeat the question. Listen carefully. Look carefully at your map. Then circle the one right answer. (Repeat the question.)

2. Now look at line 2. Which place would have been a good one for Indians who lived mainly on acorns? Was it place 3, place 4, place 5, place 7? Circle the one best answer.

3. Now look at line 3. Which place was probably visited by Indians, but not used as a permanent village? (Permanent means all the time.) Was it place 1, place 2, place 3, place 5? Choose the one best answer. Circle it.

4. Now look at line 4. Which place was probably the largest Indian settlement? Was it place 3, place 4, place 6, place 7? Circle the best answer.

5. Some of the Indians of this region probably moved about in search of different food. Question 5 shows 4 possible ways the Indians might have moved. One answer is right. Choose one. Put an X on the line in front of the answer you choose. The first answer says the Indians at place 1 moved to place 2 for food. The second answer says the Indians at place 2 moved to place 7 for food. The third answer says the Indians at place 3 moved to place 4 for food. The last answer says Indians at place 6 moved to place 5 for food. Only one of these answers is right. Mark one answer with an X.

6. Now look at question 6. Here are four more possible ways Indians might have moved about. Choose the one best answer. Mark it with an X. The first answer says Indians at place 7 moved to place 4 for food. The third answer says Indians at place 4 move to place 5 for food. The fourth answer says Indians at place 5 moved to place 4 for food. Only one of these answers is correct. Mark it with an X.

for PAGES 2-3

Distribute Regional Map II (symbolic map of ypothetical region, with landforms, wind direction, and ce locations identified).

Say:

Place Map II in front of you. Turn to page 2 in your answer book. Write your name at the top of the page. Then listen to what I tell you to do.

Look carefully at this map. It shows land near the ocean, where rivers and mountains are found. Arrows show the wind direction during the winter months of the year. Eight places are marked on this map. Find place 1, 2, 3, 4, 5, 6, 7, and 8.

Listen carefully to these questions. Then circle one answer for each question.

7. Look at line 7 on your answer sheet. Find a place on your map where you would find chaparral growing. Is it place 1, place 2, place 4, or place 7? Circle the one best answer.

8. Now look at row 8. Find a place on your map where you would find riparian vegetation. Is it place 1, place 2, place 5, or place 6? Choose the one best answer. Circle it.

9. Now look at line 9. Find a place on your map where you would find oak parkland. Is it place 2, 5, 6, or 7? Circle the one best answer.

10. Now look at line 10. Find a place on your map where you would find coastal sage vegetation. Is it place 1, 3, 4, or 7? Circle the one best answer.

11. Now look at line 11. Find a place that probably has the heaviest rainfall during the year. Is it place 1, 3, 5, or 8? Circle the one best answer.

12. Now look at line 12. Find a place that probably is a desert. Is it place 1, 3, 4, or 7? Circle the one best answer.

13. Think back now to the time the Spanish settlers first came to a region like this one. Listen carefully to these questions. Choose the one best answer. Look now at line 13.

    Find the place that would probably develop as the first Spanish pueblo in this region. Is it place 1, place 5, place 7, or place 8? Choose the one best answer. Circle it. Where would the pobladores build their first city?

14. Look at line 14. Find the place on your map that would probably develop as the first Spanish military fort in this region. It is place 1, 2, 7, or 8? Circle the one best answer.

15. Look at line 15. Find a place where there is probably a good, year-round source of fresh water for drinking and for crops. Was it place 1? place 3? place 7? place 8? Circle the one best answer.

16. Now look at line 16. Find a place where ranchos would first be claimed. Would it be place 1? place 4? place 5, or place 7? Circle the one best answer.

17. Now look at line 17. Find a place where ranchos would probably develop next. Was it place 2, place 4, place 7, or place 8? Circle the one best answer.

18. Look at line 18. Find a good place for building a dam to prevent flooding in the rainy season. Is it place 1, place 3, place 6, or place 7? Circle the one best answer.

19. Now look at line 19. Find a place where early settlers would probably need to depend on wells for drinking water. Is it place 1, place 6, place 7, or place 8? Circle the one best answer.

20. Now look at line 20. Find a good place to build ditches to carry water to irrigate crops such as wheat, vegetables, and fruit trees and vines. Is it place 4, 6, 7, or 8? Circle the one best answer.

21. Now look at line 21. Find a good place to build a reservoir to provide water for a growing city. Is it place 1, 3, 6, or 7? Circle the one best answer.

22. Now look at line 22. Find a good place to settle if settlers depended mainly on nearby water for their needs. Was it place 3, 6, 7, or 8? Circle the one best answer.

23. Now look at line 23. Find a place where a city would probably grow when a good water system was built to pipe water to many homes. Is it place 2, 4, 5, or place 8? Circle the one best answer.

24. Now look at line 24. Find what is probably the last place to grow into a city, because of the difficulty of getting water for people's homes. Is it place 1, 4, 7, or 8? Circle the one best answer.