1962

Evaluation of lessons to teach introductory map skills in grade four

BOSTON UNIVERSITY

SCHOOL OF EDUCATION

Dissertation

EVALUATION OF LESSONS TO TEACH INTRODUCTORY MAP SKILLS IN GRADE FOUR

Submitted by

S. Edward Weinswig

(B.S., University of Massachusetts, 1950)

(Ed.M., Harvard University, 1954)

In Partial Fulfillment of Requirements for

the Degree of Doctor of Education

1962

First Reader: W. Linwood Chase

W. Linwood Chase
Professor of Education

Second Reader: B. Alice Crossley

B. Alice Crossley
Professor of Education

Third Reader: Helen A. Murphy

Helen A. Murphy
Professor of Education

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INTRODUCTION

Recent scientific accomplishments in earth-space relationships emphasize the need for greater skill and facility in using maps. To understand today's world, one must be proficient and skillful in reading and interpreting maps.

The task of initiating map skills instruction has usually been delegated to the social studies program of the elementary school. The initial phases of the basic instructional program must be carefully planned to involve the realm of the child's interests and experiences. The ability to read maps correctly and to get information from them is a developmental process which must be progressively improved and refined throughout life. Findings reveal the inadequacy of pupils at every level to apply basic knowledges in these skills. Educators have expressed disappointment concerning the apparent lack of mastery of map skills.

There is evidence that increased achievement in skills subjects is possible when special services, intensive practice in areas of weakness, and small groups, paired study, and team learning techniques are provided.

The purpose of this study was to develop and evaluate a planned program in social studies to teach basic map skills in the fourth grade with children working alone, in pairs, or in teams of three.

CHAPTER I

REVIEW OF RESEARCH

Map Skills in the Social Studies Program

The ability to read a map is merely a means toward an end. The ultimate objective is a more thorough knowledge of the world we live in--with an appreciation of its people and an understanding of their mode of living. Now more than ever, with the changing technology of our era and the challenges of today's society, every possible avenue must be explored to develop a wholesome attitude toward the area in the school curriculum known as the social studies.

"Social studies" was defined in 1916 by the Committee on Social Studies of the Commission on the Reorganization of Secondary Education of the National Education Association. The Committee defined the social studies as "those whose subject matter relates directly to the organization and development of human society, and to man as a member of social groups."[1]

Jarolimek states:

> 'Social studies' is an inclusive but highly specific term applied to that area of the elementary school curriculum which has a primary responsibility for assisting the child develop skill in and understanding of human relationships. The social studies deal with the study of man and his relationship with other men and with his environment.[2]

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[1]United States Bureau of Education, The Social Studies in Secondary Education, Bulletin, 1916, No. 28 (Washington, D. C.: Government Printing Office, 1928), p. 1.

[2]John Jarolimek, Social Studies in Elementary Education (New York: The Macmillan Company, 1959), p. 3.

Michaelis agrees that "the social studies are concerned with people and their interaction with their social and physical environment; they deal with human relationships."[1]

The importance of a sound program of social studies in the elementary school program is recognized by Preston:

> The role of the social studies in elementary education is to aid the child, from kindergarten or first grade through sixth grade, to understand the concepts that describe and explain human society and to develop the insights and skills required by democratic citizenship.[2]

According to Moffatt and Howell,

> The social studies are those subjects selected for study from the social sciences. Generally speaking, this field includes history, geography, civics and current affairs. In the course of pupil experiences, this list may also include some sociology, political science, economics, and anthropology. These areas of study are so interrelated that their combination appeals to the interests of boys and girls and provides rich sources for exploration. Instruction in the social studies offers an opportunity for the child to acquire knowledge, skills, interests, attitudes, a sense of responsibility, and self-motivation as a basis for social competence.[3]

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[1]John U. Michaelis, Social Studies for Children in a Democracy (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1956), p. 2.

[2]Ralph C. Preston, "The Role of Social Studies in Elementary Education," Social Studies in the Elementary Grades, Fifty-sixth Yearbook of the National Society for the Study of Education, Part II (Chicago: University of Chicago Press, 1957), p. 4.

[3]Maurice P. Moffatt and Hazel W. Howell, Elementary Social Studies Instruction (New York: Longmans, Green and Company, 1952), p. 10.

Heffernan,[1] Blough,[2] and Rugg[3] assign to the social studies program the responsibility of helping youngsters to become acquainted with the world and its people.

Haefner states:

> One of the most valuable contributions the teacher can make to the education of youth is the development of a wide range of skills that will be invaluable to them as they enter adult citizenship. . . . It is the responsibility of every social studies teacher and school administrator to do everything possible to incorporate the development of these skills into their teaching and school program.[4]

Attitudes, appreciations, and understandings are implemented and reinforced only through the development of concrete skills.

> . . . social studies helps further many skills, including those for which it carries major responsibility. Problem solving, including the ability to locate, organize, and use pertinent data, skill in participating as a group member, interpreting maps, globes and graphic materials, and interpreting time and chronology are some of these.[5]

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[1]Helen Heffernan, "Social Studies in Relation to the Total Elementary School Program," Social Studies in the Elementary School, Fifty-sixth Yearbook of the National Society for the Study of Education, Part II (Chicago: University of Chicago Press, 1957), p. 120.

[2]Glen O. Blough, "Science and Social Studies in the Elementary School," Twenty-seventh Yearbook of the National Council for the Social Studies (Washington, D. C., 1957), p. 189.

[3]Harold Rugg, "Do the Social Studies Prepare Pupils Adequately for Life Activities?" The Social Studies in the Elementary and Secondary School, Twenty-second Yearbook of the National Society for the Study of Education, Part II (Bloomington, Illinois: Public School Publishing Company, 1923), p. 2.

[4]John H. Haefner, "Skills in Social Studies," Twenty-fourth Yearbook of the National Council for the Social Studies (Washington, D. C., 1954), Preface.

[5]Edith P. Merritt, Working with Children in Social Studies (San Francisco: Wadsworth Publishing Company, Inc., 1961), pp. 43-44.

The ability to read a map correctly and to get information from it is considered one of the basic study skills. Within a planned social studies program, readiness and instruction in map reading should provide learning goals of geographic relationships which eventually lead to the knowledges and appreciations of man and his universe.

Map reading is merely the first step toward understanding the map itself. Continuous developmental exercises provide the basic knowledges and insights which lead to a geographic viewpoint in visualizing the world as a whole.

Scarfe writes:

> A study of the world which does not attempt to associate facts of the environment with facts of human activity and thereby come up with good ideas on how the world's resources may be better used and human understanding the world over more appropriately fostered, cannot be called geography. Geography is designed to develop goodwill and international understanding. It is not designed to crowd the mind with a compendium of information about capes and bays, or capitals and products, or cities and factories of the world. No geography worthy of the name can get on without the essential details and facts of the world, but it can never become geographical education until a child thinks through these facts for himself by active experimental methods and arrives at ideas and impressions which will modify his future outlook and behavior for the good. The essential geographic educational process, therefore, is the thinking process or the improvement of the intellectual power of the mind to make finer judgments, wiser discriminations and more humane directions.[1]

Hatcher agrees:

> Our nation needs an informed citizenry trained for intelligent participation in global affairs. It is essential that our citizens be able to read and to use effectively various types of maps and globes. An increasing amount and variety of information is shown on maps. Unless these tools are understood, advocates

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[1] Neville V. Scarfe, "Geography Across the Curriculum," Journal of Geography (March, 1959), 58:3:111-121.

of conflicting ideologies will be able to use them to distort truth and to present their concepts in a convincing manner.[1]

Moffatt states:

> Maps are the most effective sources for some types of information and are essential for correct geographic interpretation. Their use should be so much a part of all social studies instruction that pupils, through constant reference, become thoroughly familiar with them.[2]

Jarolimek delegates the importance of these specifics to the social studies program:

> Social studies has a special responsibility to teach youngsters the skills of reading and interpreting globes and maps. While this has been one of the purposes of social studies instruction for many years, the need for skill in the use of these tools has taken on additional importance in modern times because of the course of world events.[3]

Moffatt elaborates on the value of the map as an essential part of the social studies program:

> Maps are an indispensable part of all social studies instruction. . . . There is scarcely a topic discussed in the social studies class that cannot be made more realistic and meaningful through the use of an appropriate map.[4]

Lee and Lee feel that the goals of the social studies program can be partially realized through a dynamic program in map skills instruction:

> Maps serve many valuable purposes in helping pupils to understand a number of phenomena in their relation to social

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[1]Helene Hatcher, "Teaching of Maps and Globes for Better World Understanding," School Science and Mathematics (June, 1951), 51:447.

[2]Maurice P. Moffatt, Social Studies Instruction (New York: Prentice-Hall, Inc., 1950), p. 213.

[3]Jarolimek, op. cit., p. 166.

[4]Moffatt, op. cit., p. 215.

> studies. . . . Investigations have shown that map reading is usually poorly taught, but that when it is well taught the child can come to understand how to read and use maps with meaning and facility.[1]

The reason for this is reported by Morse:

> Intelligent map reading tends to develop intelligent diagnosis of human and world relationships. Incidental or non-directive map teaching is not sufficient for all of the vicarious travel encountered in the social studies. Since the cartographer's language introduces a new symbolic communication, a mental picture behind each feature on the map becomes a necessary step to understanding. The ability to read types of specific information from maps and globes needs to be developed gradually and in systematic progression as early as possible.[2]

Davis has discussed the many values to be achieved through proficiency in map skills accomplishment. She regards the map as the most abstract of the visual aids, yet feels that ". . . there are lasting rewards in pleasure and profit for those who can interpret maps, but much effort is needed before a pupil can look at a map and visualize an area inhabited by flesh and blood people."[3]

Chase regards the meaningful interpretations of maps as the primary goal in map skills instruction:

> Skill in locating information desired in a map is not enough--the information must have meaning. . . . Exercise in map study makes little contribution to the building of

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[1]J. Murray Lee and Dorris May Lee, The Child and His Curriculum (New York: D. Appleton-Century Company, 1950), p. 278.

[2]Kathryn Morse, "A Systematic Progression of Social Studies Skills for the Interpretation of Maps and Globes in Grade Four" (unpublished Master's thesis, Boston University, Boston, 1956).

[3]Hazel Davis, "What Can Elementary School Pupils Learn From Maps?" Social Education (November, 1948), 12:317.

> meanings in the pupil unless they bear some relation to a real problem.[1]

Kohn writes:

> To use maps effectively as instructional aids in the social studies, it is necessary to discover how maps perform their fivefold function. This requires an understanding of direction, distance, and the use of conventional symbols. It also requires the development of an ability to use these concepts in gaining ideas about the ecological and spatial association of people and places.

He lists the fivefold function of maps:

1. They show the location and arrangement of things, both cultural and natural, on the face of the earth.
2. They are a means of expressing the associations which man has established with the land.
3. They are a means of plotting phenomena so that their interspatial relationships may be recognized readily.
4. They enable the reader to grasp all the essential traits of a region.
5. They serve as a source of ideas concerning the social, political and economic effects of the distribution of phenomena.[2]

Renner regards the map as a precision instrument which will ". . . give information only to those who can interpret the arbitrarily assigned meanings."[3]

Lobeck contends that map reading and map interpretation have separate functions in the developmental process toward proficiency with map skills:

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[1]W. Linwood Chase, Wartime Social Studies in the Elementary School, National Council for the Social Studies, Curriculum Series, No. 3 (Washington, D. C.: 1943), pp. 45-46.

[2]Clyde F. Kohn, "Maps as Instructional Aids in the Social Studies," Audio-Visual Materials and Methods in Social Studies, Eighteenth Yearbook of the National Council for the Social Studies, William H. Hartley, editor (Washington, D. C.: National Council for the Social Studies, 1947), p. 123.

[3]George T. Renner, "The Use of Maps in Teaching," Toward Better Understanding and Use of Maps, Globes, and Charts (Chicago: Denoyer-Geppert Company, 1955).

> Map reading is what all of us do when we want to find out where a place is on the map, or the distance between places, or their relative positions, or any other simple geographic fact. . . . But map interpretation is much more than all this. Map interpretation is like the process of reading between the lines of a story whereby the reader draws certain inferences and conclusions which the author did not specifically make.[1]

Schenck writes:

> Every individual should have the ability to interpret maps and understand the information revealed on maps. There are many types of information that can very clearly be shown on or read from maps. The ability to read the specific types of information from maps should be developed as early as possible in a simple and gradual process.[2]

The development of map skills requires carefully planned teaching and thorough adaptation in order to achieve success within the social studies curriculum. Maps are important and demand analytical progression in the planned program. Yet the obvious need for instruction in map skills is often minimized.

Renner believes:

> The map is by far the most important of all the major visual instruments in education, much more important than sound film. It holds this rank because of its priority value in concept building, and because of its variety of uses. Nevertheless, it is the most neglected of all the so-called visual aids.[3]

According to Kohn,

> Maps are not 'pictures' of a portion of the earth's surface, but 'symbolic representations.' To read maps intelligently one

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[1]Armin K. Lobeck, Things Maps Don't Tell Us (New York: The Macmillan Company, 1956), p. x.

[2]Margaret E. Schenck, "Evaluation Exercises to Develop Skills in Map Interpretation" (unpublished Master's thesis, Boston University, Boston, 1952).

[3]George T. Renner, "The Map as an Educational Instrument," Social Education (November, 1940), 4:447.

must learn to translate these symbols into realities. Each new symbol must be carefully introduced and the difficulty of the map should be gradually increased as the children's ability to read map symbols increases. . . . Children need to learn how to read maps before they can read maps to learn.[1]

Dallolio elaborates:

If we are to put greater emphasis on geographic content, we cannot overlook the difficulties that children have in reading geography. Learning to read effectively geographic content is a difficult, complicated and long-enduring task.[2]

Wesley writes:

The universal use of maps in books, magazines, newspapers, advertisements, and in various other situations demonstrates the desirability of learning to utilize them effectively. The teacher of the social studies should assume that the full import of maps has not been grasped by the students of any grade level.[3]

Whittemore stresses the need for a thorough program in map interpretation. She contends:

The use of maps in the school program has two major objectives: (a) training in map reading and (b) the use of maps as sources of information. Most map experiences contribute to both ends.

A number of geographers have examined the difficulties shown by students in map reading. Others have studied the steps and procedures by which map skills can be developed. In their conclusions, all emphasize the need for careful training in map interpretation. They agree that experiences in the use of maps should not be left to chance, but carefully planned.[4]

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[1]Kohn, op. cit., p. 127.

[2]Helen Carey Dallolio, "Trends in Geographic Content Re-emphasizes Difficulties in Reading," Journal of Geography (March, 1959), 58:144.

[3]Edgar Bruce Wesley, Teaching Social Studies in High Schools (Boston: D. C. Heath and Company, 1950), p. 370.

[4]Katheryne T. Whittemore, "Maps," Geographic Approaches to Social Education, Nineteenth Yearbook of the National Council for the Social Studies, ed. Clyde F. Kohn (Washington, D. C.: National Council for the Social Studies, 1948), pp. 118-119.

Whipple has found that ". . . emphasis should be placed on geographic comprehension instead of on the accumulation of facts about each and every area of the world."[1] In continuing, she cautions:

> Teachers should be given help in defining the outcomes for which they are working such as the specific concepts and skills, and also in determining the experiences that the child requires before he can attain these outcomes. Teachers will then be in a position to make geography an interesting, exciting part of the social studies program.[2]

The development of concepts requires an understanding of their formulation and their role in the social studies program.

Development of Concepts

Concepts in the social studies have been defined in numerous ways. A concept has been described as an abstraction,[3] a class or a group of objects which have certain qualities in common,[4] a group of meanings put together under one label,[5] and a generalization about re-

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[1]Gertrude Whipple, "Geography in the Elementary Social Studies Program: Concepts, Generalizations, and Skills to Be Developed," New Viewpoints in Geography, ed. Preston E. James, Twenty-ninth Yearbook of the National Council for the Social Studies (Washington, D. C.: National Education Association, 1959), p. 143.

[2]Ibid.

[3]Merritt, op. cit., p. 37.

[4]William A. Brownell and Gordon Hendrickson, "How Children Learn Information, Concepts and Generalizations," Learning and Instruction, ed. Nelson B. Henry, Forty-ninth Yearbook of the National Society for the Study of Education, Part I (Chicago: The University of Chicago Press, 1950), p. 106.

[5]Ralph H. Ojemann, "Social Studies in the Light of Knowledge About Children," Social Studies in the Elementary School, ed. Nelson B. Henry, Fifty-sixth Yearbook of the National Society for the Study of Education, Part II (Chicago: The University of Chicago Press, 1957), p. 88.

lated data.[1]

Concepts are developed by the child early in life. As experiences are built up, concepts are enlarged. The child enters school with many concepts. As he proceeds through the learning cycle, concepts are implemented to various degrees of meaningfulness.

Russell regards concepts as meanings which emerge from precepts, images, and memories. He contends that a person is not born with concepts, but develops them through additional meanings in his experience.[2]

Whipple states:

> Concepts develop from concrete to abstract as the learner draws from his experiences a general idea apart from the particulars he has noted. No one can give the learner a concept. He must build it out of his own experiences. The process is a gradual one that usually takes place over a period of years, as the child has experiences which contribute to growth in meaning. . . . Building up the child's background of experience is of tremendous importance.[3]

Davis feels that "guiding children in the development of concepts is a major function of the teacher. . . . Concepts may be viewed as having dimensions; that is, they change and, as they develop subtleties, complexities, and differentiations of meaning occur.[4]

Jarolimek says, "Concepts which may be related to concrete real-

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[1]David H. Russell, Children's Thinking (New York: Ginn and Company, 1956), p. 68.

[2]Ibid., p. 117.

[3]Whipple, op. cit., pp. 113-114.

[4]Ozro Luke Davis, Jr., "Learning About Time Zones: An Experiment in the Development of Certain Time and Space Concepts" (unpublished Doctoral dissertation, George Peabody College for Teachers, Nashville, Tennessee, 1958), pp. 4-5.

ity are more easily understood by young children than are those which are wholly abstract."[1]

Development of concepts cannot be ascribed to a specific time or place. The degree to which a concept achieves meaningfulness depends upon the accumulation of previous experiences and learnings.

Davis writes, "Concepts are learned in relation to all of one's experiences. A child, by his normal developmental processes, amasses a great number of concepts."[2]

According to Burton, "Some concepts are learned principally as a result of out of school life, whereas others have been shown to result primarily from classroom experiences."[3]

Research by Davis purports one theory that concept development is a process of moving from one stage or level to another in a hierarchal pattern; however, some studies indicate that growth is less sharply differentiated and progresses continuously, gradually, and cumulatively.[4]

Harrison[5] and Hurlock[6] contend that concepts do not remain as

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[1]Jarolimek, op. cit., p. 54.

[2]Davis, op. cit., p. 5.

[3]William H. Burton, et al., Children's Civic Information, 1924-1935, Southern California Education Monographs, No. 7 (Los Angeles, The University of Southern California Press, 1936), p. 13.

[4]Davis, op. cit., p. 7.

[5]M. Lucile Harrison, "The Nature and Development of Concepts of Time Among Young Children," Elementary School Journal (March, 1934), 34:7:507-514.

[6]Elizabeth B. Hurlock, Child Development (New York: McGraw-Hill Book Company, Inc., 1956), p. 374.

separate entities. Growth in one concept may directly depend upon the development of other concepts. The accumulation of knowledge may enrich one concept and may help in the learning of others.

Davis states:

> Accumulation of meaningful experiences, accompanied by increasing age is the most important factor in concept development. The quantity and quality of concepts held by a person is more directly related to the experiences he has had than to his intellectual capacity.[1]

Vinacke also asserts that the principal reason for differences in concepts held by children is the variation in their experiences.[2]

Thus, on various studies of concepts it becomes apparent that there is a wide range of categories of meanings held by the subjects, from maximum skills of interpretation to a level of complete misconception.

Davis reports:

> Concepts have been shown to develop along a continuum of meaningfulness from simple to complex, from concrete to abstract, from variable to stable, from inconsistent to more accurate and consistent.
>
> Guiding the development of children's concepts is not a simple affair, for the process of concept development is not simple. Concepts are complex relationships of meanings, but their development is a normal part of growth. Concepts develop continuously, gradually, and cumulatively, and their mastery depends upon the needs, interests, and maturity of the learner.
>
> Concepts cannot be given to a person. One must build them for himself out of his own experiences and this process takes time.[3]

Whipple considers the meaningful approach to social studies as the basis for proper concept development. "Concept formation is dis-

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[1]Davis, op. cit., p. 9.

[2]W. E. Vinacke, "Concept Formation in Children of School Age," Education (May, 1954), 74:527-534.

[3]Davis, op. cit., p. 9.

tinctly different from mere fact learning. A child may report facts accurately after reading a textbook and yet have no grasp of the concepts implied."[1]

Davis asserts that "the basic process in acquiring concepts, thus, can be seen to involve differentiation and synthesis. To clarify a concept, the learner may use inductive, deductive, and often creative thought."[2]

James regards the role of teaching today's social studies as an unlimited opportunity to enrich and extend the development of concepts by returning "the hard core of geography to the social studies . . . not geography as a list of things contained in an area, but geography as the analysis of the meaning of place and position on the earth, as an analysis of the significance of the real associations of things."[3]

According to Davis,

> For effective school learning, planned, systematic instruction must be employed. Instruction in the social studies relating to important concepts and knowledge cannot be left to chance. Misconceptions can rarely be ascribed to absence of meaning, but rather to incomplete and inaccurate meanings. Maturation of the learner is not sufficient to guarantee adequate concept development. Thus, planned instruction is needed. Social studies theory which has advocated deferment of certain concepts, such as those of time and space, has been justified on the basis of what is known about the slow maturation of children's concepts and the misconceptions found in children's thinking. Such theory has seldom been bolstered by data from experimental studies.[4]

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[1]Whipple, op. cit., p. 114. [2]Davis, op. cit., p. 10.

[3]Preston E. James, "The Hard Core of Geography," New Viewpoints in Geography, op. cit., pp. 8-9.

[4]Davis, op. cit., pp. 83-84.

Concepts are often broad in scope and demand repeated practice for relating acquired knowledge to skills. Whereas concepts are continually being implemented by many forces, the development of a skill must come step by step. Specific map skills have been recommended for certain grade levels.

Grade Placement of Map Skills

The definite placement of map skills within the social studies program cannot be convincingly assigned to a particular grade level. However, recommendations as to grade placement of map skills are generally prescribed. An analysis of this situation would indicate that the introduction of certain skills at specific grade levels is not always practical since map instruction has not been in keeping with the tenets of child psychology. There has been little regard for readiness in map skills instruction. Children are often expected to delve into the complexities of map reading and interpretation as soon as they reach the intermediate grades. This may be due to the inability of some teachers to institute a comprehensive readiness program, or to the fact that children ordinarily receive their first social studies textbook in the fourth grade.

A map skills readiness program must be established through the early primary grades and basic concepts and skills must be fortified and implemented as the child progresses from one grade to the next. As in other areas of the curriculum, a sound program of development must be established, recognizing that various levels of ability exist in the

interpretation and usage of map skills.

Kohn says, "The groundwork for map reading needs to be laid throughout the elementary years."[1]

Sabaroff, in her study on geographic readiness in the primary grades, found that too many pupils, and even teachers, are deficient in important phases of geography. However, "research has shown that young children can work effectively with the simpler problems of geography when these problems are kept within the background of their experience."[2]

Whipple agrees that an over-all deficiency among pupils and teachers

> . . . is unfortunate at a time when geographic thinking is essential to intelligent decisions on international problems. . . . Important concepts and skills should be initiated in the first grade and applied, and extended from one grade to the next higher, all the way through the secondary school.[3]

Michaelis states, "The use of maps must be related to children's backgrounds and experience, concepts and symbols must be developed gradually, and map-reading skills must be put to use in solving problems."[4]

The need for initiating map skills work in the lower grades is emphasized by Collier and Vodicka:

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[1]Clyde F. Kohn, "Geographic Instruction on the Intermediate and Upper Grades," Geographic Approaches to Social Education, Nineteenth Yearbook of the National Council for the Social Studies, ed. Clyde F. Kohn (Washington, D. C.: National Council for the Social Studies, 1948), p. 129.

[2]Rose Sabaroff, "Geography Readiness: Developing Map Skills and Understanding in Primary Grade Social Studies" (unpublished Doctoral dissertation, Stanford University, Stanford, California, 1957), pp. 3-7.

[3]Whipple, op. cit., pp. 112-113.

[4]Michaelis, op. cit., p. 276.

> The selection and use of maps can start in the primary grades with gradual beginnings. Moving from the concrete to the abstract, from the simple to the complex, the teacher can effectively guide the child to understandings of maps and map skills that will lay an effective base for the map skills taught in the later elementary grades.[1]

Bathurst concurs:

> The skills required in reading maps should begin with children in the primary grades. There is a great need for developing map reading readiness.
>
> Teachers must realize that map reading, like word reading and picture reading, is a developmental continuing process which requires several skills.
>
> Many lessons and years of growth will be required for mastery of map reading skills.
>
> If maps are to be used effectively in the classroom, it is essential that the students have a complete understanding of maps. The reader of a map must know that it is a 'bird's eye view,' drawn with lines, of a given area or section of the earth. This may be a relatively small area or it may include the entire surface of the earth. With few exceptions, a map is not a photograph nor is it a realistic view of the area represented.[2]

Whipple also encourages a meaningful readiness program for primary grade children prior to instruction in map reading.[3]

Chace has found that children at the first grade level can develop many meanings relating to map symbols, direction, and distance.[4]

Sabaroff considers the early introduction of map skills necessary for the development of successful map readers. Her study revealed suc-

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[1]Richard E. Collier and Edward M. Vodicka, "The Place of Maps in the Primary Grades," School Activities (March, 1960), 31:212-213.

[2]Leonard Bathurst, "Developing Map Reading Skills," Journal of Geography (January, 1961), 60:26.

[3]Gertrude Whipple, "Elements in Geography Readiness," Elementary School Journal (December, 1941), 42:256-257.

[4]Harriett Chace, "Map Skills in the First Grade," Social Education (December, 1955), 19:361-362.

cessful results in introductory map skills due to the presentation of concepts within the scope of understanding of the primary grade child.[1]

Suggestions for the adaptation of basic map skills to any particular grade level would nevertheless have limitations. The needs of a group and, more specifically, of the child, provide the main objective as to what is required at any level. An established list of skills must have flexibility. The process must be developmental and the individual child must be the sole consideration. With the needs of the child in mind, the social studies program may revolve around the suggested literature for the gradation of content. "One of the conditions of learning is the proper grading of content. Meeting this condition involves adjustment between the pupil and what he is to learn."[2]

Morris recognizes the need for some gradation of material in the teaching of map skills. He relates the concern of geographers, and questions ". . . what geography, or geographical concepts, should be taught at each grade level?" He asserts that it is a problem to determine ". . . the material to be taught at various grade levels."[3]

Most educators agree that basic map skills can be introduced in a concrete manner in the primary grades and that a readiness program can serve a manifold purpose as the child grows. However, the task

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[1]Sabaroff, op. cit., pp. 50-52.

[2]Edgar Bruce Wesley and Mary Adams, Teaching Social Studies in Elementary Schools (Boston: D. C. Heath Company, 1946), p. 65.

[3]John W. Morris, "Geography vs. the School and You," Journal of Geography (February, 1959), 58:61.

cannot be assigned to a particular grade in the elementary school. Every grade must share the responsibility.

Michaelis states:

> Maps are a unique combination of symbols, colors, shapes and terms. . . . Because maps are symbolic representations, attention must be given to the gradual development of map language. First of all, simple maps with very little detail may be used to meet the various problems that arise. Maps should be used in a setting of meaningful content developed in on-going, units of work, isolated, encyclopedic dissection of maps in a formal manner leads to a negative attitude toward map utilization.
>
> Map reading skills should be graded in difficulty, reviewed as needed at succeeding grade levels, and put to actual use in each unit of work. It should never be assumed that children can read maps simply because maps are in their books and on the walls of the classroom.[1]

He cautions, however:

> A smooth transition from the primary grades to Grade IV is essential. No abrupt changes should occur, as many children will develop a feeling of insecurity and a lack of interest in the program if continuity is disrupted.
>
> Provision should be made for an increasing range of individual differences in all phases of the program. Differences in reading ability, communication skills, ability to use maps and globes, and problem-solving skills increase as children mature. As a result, the use of materials of varying levels of difficulty, flexible grouping, individualized procedures, and varying degrees of expectancy in evaluation become mandatory. By providing for a variety of activities in each unit all children can make a contribution.
>
> The emerging tendency to accept and use peer values offers opportunities to increase skills in cooperative group work. Group planning, action, evaluation and formulation of behavior standards should be emphasized. Increasing emphasis should be given to self-control, leadership responsibilities, followership responsibilities, and techniques of cooperation.[2]

Morse conducted a study on the systematic progression of social studies skills for the interpretation of maps and globes in the fourth

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[1] Michaelis, op. cit., pp. 274-276.

[2] Ibid., pp. 77-78.

grade. Although she contained the emphasis of the study to one grade level, she maintains:

> Readiness and instruction in the use of maps and globes should be a definitely planned program. Map reading skills require a certain sequence of understandings before children can comprehend the realities symbolized on a flat surface or a sphere representing the earth.
>
> Since social studies deal with human relationships, the map and globe reading skills should be a part of every classroom activity where associations are needed for remote or unfamiliar portions of the earth. Skills should be adapted to the ability and current experiences of pupils in translating abstractions into realities. Continuity of teaching and reteaching these steps to map interpretation is necessary for developing and maintaining competence.[1]

Grund and Long recognize the problems that exist in map skills instruction. Their study was conducted in grade four, but an analysis of their material reflects the possible usage of their exercises at points of need. They declare, "Map instruction must be modified to harmonize at each level of advancement with the actual intellectual capacities, interests and needs of the children."[2]

Separate studies by Davis,[3] Kohn,[4] and Whittemore[5] encourage intensive application of specific map reading skills in the intermediate grades. They feel that the instructional job is one that must be-

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[1]Morse, op. cit., p. 3.

[2]Carolyn Grund and Helen C. Long, "Exercises to Develop Skill in Map Reading in Grade Four" (unpublished Master's thesis, Boston University, Boston, 1954), p. 14.

[3]Davis, op. cit., p. 356.

[4]Kohn, "Geographic Instruction on the Intermediate and Upper Grades," op. cit., p. 129.

[5]Whittemore, op. cit., p. 118.

come comprehensive by the fourth grade.

Howe conducted a study which showed that "careful, exact teaching along definite lines will produce in the average child in the fifth and sixth grades the ability to interpret accurately any map's fund of information."[1]

James feels that we should not assume any understanding of the symbols or any ability to read the message of the map on the part of the student when maps are first introduced. He says, "The approach to the development of map reading skill must come step by step, just as the reading of words and sentences is taught."[2]

Parker has visualized geography instruction on a total picture:

> Effective gradation in the development of map-reading ability involves the introduction of new objects, new symbols, and new terms at those points where they first are needed for geographic purposes and in such a manner that thereafter the child is able to use them efficiently in getting geographic information for himself.[3]

It is generally agreed that many skills are involved in the interpretation and reading of a map. Jarolimek states, "In teaching map reading skills to children it must be remembered that both reading and

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[1]George F. Howe, "A Study of the Ability of Elementary School Children to Read Maps," The Teaching of Geography, Thirty-second Yearbook of the National Society for the Study of Education (Bloomington, Illinois: Public School Publishing Company, 1933), pp. 486-492.

[2]Preston E. James, "Developments in the Field of Geography and Their Implications for the Geography Curriculum," Journal of Geography (September, 1947), 46:224.

[3]Edith Putnam Parker, "Major Conclusions to Be Drawn from the Investigation," The Teaching of Geography, Thirty-second Yearbook of the National Society for the Study of Education (Bloomington, Illinois: Public Schools Publishing Company, 1933), pp. 165-166.

interpretive skills are involved, and the interpretive skills depend heavily upon maturity and background knowledge."[1]

An examination of the research in map skills for the intermediate grades usually provides goals for proficiency in map reading.

Spelman worked with a group to construct and evaluate a map skills test for the intermediate grades. It was necessary for the group to compile a list of map skills and abilities for intermediate grades from articles, theses, and books. The following skills were considered fundamental:

1. Ability to read natural symbols on a map
2. Ability to read the legend of a map
3. Ability to know and recognize geographic features
4. Ability to read and understand general directions on a map
5. Ability to read and use map scale
6. Ability to interpret comparative distance
7. Ability to locate and interpret the earth's division factors
8. Ability to read elevation maps by color bands and simple contour lines
9. Ability to read and understand slope of land from river flow
10. Ability to read cultural symbols on a map
11. Ability to read and interpret political division on a map
12. Ability to read pattern maps to determine distribution of natural features, as rainfall, vegetation, and mineral resources
13. Ability to read pattern maps to determine cultural features, as crops, population and transportation
14. Ability to read and compare a specific area on several kinds of maps
15. Ability to read and use parallels and meridians
16. Ability to use latitude and longitude in determining location
17. Ability to use longitude in calculation of standard time
18. Ability to read and interpret various map projections
19. Ability to associate locational facts with human activities

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[1]Jarolimek, op. cit., p. 180.

20. Ability to read cultural relations to topography.[1]

Sullivan investigated available literature to determine the map skills for the intermediate grades. Major skills included:

1. Natural symbols
2. Cultural symbols
3. Knowledge of directions
4. Reading comparative distances
5. Location of Equator, Arctic and Antarctic Circles and Zones
6. Man and his environment
7. Elevation (Map Reading)
8. Latitude and seasons.[2]

In a test by Howe, the following were listed as skills:

1. Ability to read and apply symbols shown in the key or in the margin
2. Ability to read and apply latitude and longitude
3. Ability to know direction (by parallels and meridians)
4. Ability to use the scale and estimate mileage
5. Ability to read inscriptions such as height above sea level.[3]

Uttley has listed objectives of map study for grade four:

1. To recognize the regions studied on a simple map
2. To apply sun behavior understandings when describing simple seasonal activities
3. To read symbols of natural and cultural features on simple maps
4. To read directions
5. To read relationships into a map
6. To recognize sun behavior lines, direction lines, continents by name and oceans and larger seas by name
7. To read directions by means of north-south and east-west lines
8. To read comparative distances

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[1]Mary Elizabeth Spelman, et al., "The Construction and Evaluation of a Map Skills Test for Intermediate Grades" (unpublished Master's thesis, Boston University, Boston, 1953).

[2]Margaret L. Sullivan, "A Summary of the Literature on Study Skills in the Social Studies for Intermediate Grades" (unpublished Master's thesis, Boston University, Boston, 1952).

[3]Howe, op. cit., pp. 486-492.

9. To read into the globe or hemisphere map seasonal conditions associated with distance from the equator.
10. To use correctly technical terms such as: equator, Tropic of Cancer, Tropic of Capricorn, Arctic Circle, Antarctic Circle, North Pole, South Pole, continent, hemisphere, mountain range, peninsula, strait and island
11. To recognize simple symbols
12. To associate locational facts with human activities.[1]

Further investigations reveal similar lists by Baker[2] and Shryock[3] in early studies to establish abilities in map interpretation and map reading at the intermediate grade level.

Whipple has compiled a detailed list of basic concepts, generalizations, and skills with maps for grades one through eight.[4]

Many suggestions for the implementation of geography abilities have been presented which show general accord with previously discussed skills.

The review of literature indicates extensive research in an effort to establish specific goals in map skills for the intermediate grades. Investigation shows over-all agreement among authors on the determination of basic knowledges.

Recent textbooks have adapted the suggested lists in the prepara-

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[1]Marguerite Uttley, "A Provisional Formulation of Attainments in Geography for the Elementary School," The Teaching of Geography, Thirty-second Yearbook of the National Society for the Study of Education (Bloomington, Illinois: Public School Publishing Company, 1933), pp. 252-253.

[2]Emily V. Baker, "Diagnosing Children's Ability to Use Maps," Journal of Geography (September, 1938), 37:227-231.

[3]Clara M. Shryock, "Gradations in Map Learning," Journal of Geography (May, 1939), 38:5.

[4]Whipple, "Geography in the Elementary Social Studies Program," op. cit., pp. 112-143.

tion of instructional goals. A review of certain textbooks provided further basis for the inclusion of specific skills in the study.

McIntyre has prepared her concept of the over-all goals in map skills. Her listing of skills was established as essential for the fourth grade program:

1. The names of the continents
2. The general shape of each continent
3. Each continent's location with respect to the others
4. The names and locations of the oceans
5. How to tell directions on a map
6. How to locate mountains and lowlands on a map
7. How to identify rivers and lakes
8. How cities and capitals are shown
9. The differences in climate between the Northern and Southern Hemispheres
10. The relationships between maps and globes
11. That up means away from the center of the earth--not north; and that down means toward the center of the earth--not south
12. That rivers and other streams always flow from higher land to lower land.[1]

The map and globe reading skills stressed by Barrows, Parker, and Sorenson in their fourth grade textbook are:

1. Learning to read the language of maps
2. Recognizing map signs for rivers, cities, etc., and visualizing the real river or city for which the map sign stands
3. Using a globe to visualize the huge world ball on which we live
4. Using a globe to visualize where places are in the world in relation to other places and to the equator
5. Using maps as tools in learning about the lands and people of the world.[2]

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[1]Alta McIntyre, Teachers Guide for Exploring Near and Far (Chicago: Follett Publishing Company, 1956), p. 19.

[2]Harlan H. Barrows, Edith Putnam Parker, Clarence W. Sorenson, Our Big World (New Jersey: Silver Burdett Company, 1959).

Dederick emphasizes the following concepts:

1. The world is big and round
2. The surface of the earth is made up of land and water
3. The globe is a map on a sphere which represents the earth
4. The meaning of 'up' and 'down' in relation to the earth
5. The key on a map is used to interpret symbols and legends on maps
6. Large areas of water are called oceans
7. How maps were made and how they were used by navigators and explorers
8. Relationship between maps in the textbook, maps on wall, neighborhood maps and directions in a classroom.[1]

Stull and Hatch consider the goals of the fourth grade map skills program:

1. Enlarge the geographical experiences of the pupils
2. Enable the child to interpret pictures, maps, and written materials
3. Teach him the ways of living in different parts of the world
4. Help him to understand how the different countries help one another
5. Understand how the United States and all the other parts of the world are concerned with global living
6. Build up a conception of the earth as a globe.[2]

In a later edition of the same textbook, Drummond and Sloan list their major concepts as:

1. To determine directions between, and relative locations of, different places
2. To read and understand symbols used on maps and globes
3. To locate certain land features, harbors, rivers, lakes, canals, and seas of the earth
4. To draw inferences about the general climatic conditions and the ways people live in a country, based solely on information gained from maps and globes
5. To determine the relative sizes of countries

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[1]Nelle Dederick, Your People and Mine (Boston: Ginn and Company, 1960).

[2]DeForest Stull and Roy W. Hatch, Journeys Through Many Lands (Boston: Allyn and Bacon, Inc., 1952).

6. To understand the significance of travel over the polar region
7. To calculate distances by using the scales on maps and globes
8. To obtain information about the terrain of a country from maps
9. To begin the process of understanding different types of maps.[1]

Psychology of Practice

One of the greatest problems of education is that we still do not know how children learn. Factors which affect the learning process have been analyzed, yet the complexity of the total process itself remains a prime issue in education.

Southall contends that the rate of learning and the amount of retention are both affected by many factors other than teaching methods. She regards some of the most important influences in the learning process as:

> . . . the child's interest in and readiness for the experience; complexity of the learning; the age and intelligence of the learner; the material aids to learning; the recency, frequency, and contiguity of the experience; the amount and distribution of practice; and the emotional satisfaction or dissatisfaction accompanying the learning.[2]

One of the major factors influencing the learning process is that of practice. However, the amount of practice and its place within a program have become vital issues in analyzing the theory of learning.

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[1]Harold D. Drummond and Fred A. Sloan, Jr., A Journey Through Many Lands (Boston: Allyn and Bacon, Inc., 1960).

[2]Maycie K. Southall, "How Do Children Learn?" Childhood Education (December, 1959), 36:151-152.

> Practice is one of the chief instructional methods in the school, for it is one of the chief approaches to learning by the student. . . . It usually, though not always, involves a series of trials and repetitions. Practice is defined as one or more performances. However, the repetitions are not identical; as far as the learner is concerned, each one is different from the preceding one if learning is occurring.[1]

Sorenson writes that practice through repetition is not enough to guarantee efficient learning. The practice must be interesting and purposeful to make the learning effective. The importance of practice cannot be minimized.

> Lack of practice causes the memory of learned materials to weaken; and, in general, the longer the periods of disuse, the greater the loss. Human minds retain what they use. . . . We learn and retain by use and forget through disuse.[2]

Gray concurs:

> Practice or drill is not a law of learning unless there is also reinforcing progress in approaching a goal. A goal or motive, a result or success, and repetition or exercise--all three in combination result in efficient learning. . . . The implication of this trilogy of learning principles for education would seem to be clear. We can teach proficiency in problem solving if we first motivate our pupils to want the rewards we are able to give them for learning to be proficient; then, issue rewards promptly for each small unit of progress, and finally, repeat the procedure over and over again until the desired level of proficiency has been reached.[3]

Thompson, Gardner, and DiVesta contend that when one has practiced an activity many times, the activity becomes highly resistant to

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[1]Sidney L. Pressey, Francis P. Robinson, and John E. Horrocks, Psychology in Education (New York: Harper and Brothers, 1959), p. 349.

[2]Herbert Sorenson, Psychology in Education (New York: McGraw-Hill Book Company, Inc., 1954), pp. 403-405.

[3]J. Stanley Gray, "Creative Thinking, Reasoning and Problem Solving," Educational Psychology, ed. Charles E. Skinner (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1959), p. 554.

change. Repeated use will fortify the knowledge in most phases of learning.

> Frequently it is thought that repetition is a necessary condition only in the learning of skills. But practice is fundamental to the teaching of most factual materials, symbols and arbitrary associations. . . . Practice is most effective when the pupil is highly motivated.[1]

Thorndike related that ". . . no mental function has ever been deliberately practiced with an eye to improving it, and with proper opportunity for the law of effect to operate, without some improvement as a result."[2]

In cases where improvement is not realized after concentrated practice, Thorndike contributes the negative findings to the possibilities that: (1) the investigator did not inform his subjects whether their responses were correct or wrong nor what the amount of error was; (2) there was no adequate motive to improve; or (3) the practice was in so narrow a function that the limit of improvement was reached early.[3]

Whole Versus Part Learning

The development of methods and materials of instruction which will provide pleasant or satisfying results is fundamental to the learning process. However, the best application of the methods and materials remains a question in education. Many investigators have presented

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[1]George G. Thompson, Eric F. Gardner, and Francis J. DiVesta, Educational Psychology (New York: Appleton-Century-Crofts, Inc., 1959), pp. 233-234.

[2]Edward L. Thorndike, The Psychology of Learning, Vol. II (New York: Teachers College, Columbia University, 1913), p. 151.

[3]Ibid.

theories of whole and part learning.

Symonds states:

> Whether learning takes place most efficiently when attention is given to the whole task to be learned, or when the task is broken down into its elements, each of which is to be learned separately, is an issue that permeates all education.[1]

Pressey, Robinson, and Horrocks have discussed the wide divergence of opinion that exists between the whole and part methods of learning. They have presented contentions that children who learned meaningful material by a whole, rather than a part, method learned more effectively and retained their learnings longer.[2] On the other hand, there are opposing viewpoints which consider the part method of learning to be the most effective.

Peterson, Marzolf, and Bayley relate the same indecision which exists over the effectiveness of whole or part teaching.[3] Yet Pressey and his associates regard practice as an essential factor in the whole-part issue: "With practice . . . the whole method tends to become increasingly efficient. The more a learner becomes accustomed to it, the more apparent its advantages over the part method."[4]

Many psychologists have contributed theories in relation to the whole-part learning issue. Symonds has analyzed the findings, and

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[1]Percival M. Symonds, What Education Has to Learn from Psychology (New York: Teachers College, Columbia University, 1958), p. 49.

[2]Pressey, Robinson, and Horrocks, op. cit., p. 353.

[3]Harvey A. Peterson, Stanley S. Marzolf, and Nancy Bayley, Educational Psychology (New York: The Macmillan Company, 1948), pp. 237-238.

[4]Pressey, Robinson, and Horrocks, op. cit., p. 355.

concludes:

1. The whole-method has proved itself to be superior in memorizing.
2. The whole-method becomes less efficient when the passage to be memorized becomes too long or difficult.
3. The whole-method becomes increasingly effective with increasing practice in using the method.
4. The whole-method or a progressive part-method leads to superior learning of acts of skill.
5. With material of a given level of difficulty the mentally more mature individual can profit more from learning by a whole-method.
6. The whole-method is superior when there is a distribution of learning over several practice periods.
7. One should consider wholeness not in terms of the totality of what is to be learned, but in terms of the degree of integration of the unit to be learned.
8. Learning is most efficient when one first grasps the meaning and organization of the whole, and then proceeds to give attention to the parts and the relation of each part to other parts and to the whole.
9. Learning is more efficient when the material to be learned is meaningful and rich in associations.
10. One should attempt to learn only that which he understands and comprehends. If material to be learned is beyond the comprehension of the learner it should be simplified or broken down into meaningful parts.[1]

It would appear that research in the area recognizes the important characteristics of both approaches to learning. Yet, as in the process of life itself, starting with the whole and then separating into parts for ". . . expanding, differentiating, and integrating,"[2] seems to provide the key in the whole-part relationship.

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[1]Symonds, op. cit., p. 54.

[2]L. T. Hopkins, Interaction: The Democratic Process (Boston: D. C. Heath and Company, 1941), pp. 152-153.

Team Learning

Many techniques have been employed in the adaptation of instructional materials to provide the greatest service to the educational needs of pupils. Among the theories which have evolved is the team learning concept of instruction. Team learning is not new; it appears to be a natural development from programs of individualized instruction and activity programs. Current research in team learning, however, has provided added stimulus in assuring its role as a fundamental process in the instructional program.

Team learning encourages small group work. Children work in pairs, teams of three, or teams of five, depending upon the nature of the task. Often the work of the small groups is self-directed and allows for the maximum amount of differentiated instruction, according to the progress rate and level of ability of the pupil.

> The role of differentiated instruction through the grouping of pupils into teams of two's and three's in the classroom is extremely important. Since children learn at different rates and under varying conditions, their patterns of learning will be individual. Many will require individualized teaching, while others will be able to proceed at varying levels of independence.
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> Situations will arise in which individuals will work alone; others, in which pairs or small groups will prove most satisfactory.[1]

Durrell believes that "there are a great many situations where interest is heightened, comprehension is increased, and general achieve-

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[1]Walter J. McHugh, "Pupil Team Learning in Skills Subjects in Intermediate Grades" (unpublished Doctoral dissertation, Boston University, Boston, 1960), p. 47.

ment improved through pupils working in pairs or in teams of three."[1]

Gates agrees that "teachers should encourage children to get together, compare notes and try to find the best methods to use."[2]

The concept of dividing children into small groups is not a new one. Koos, as early as 1933, stated:

> The use of pupil assistants in instructing other pupils is a desirable method of raising achievement levels. However, such activities should be organized only where both pupil assisted and pupil assisting will receive comparable benefit.[3]

The theory of team learning utilizes features of individualized instruction within the scope of an activity program. McDade confirms this belief:

> . . . in small-group and individual work the pupil has the opportunity for maximum activity. The small-group situation is social, for the pupil is actively dealing with personalities and things. In individual work the social element is absent and he learns to deal with ideas and things consecutively and independently. Each of these two 'active pupil' techniques has inestimable values for education.[4]

Durrell, who has initiated much of the experimentation in team learning, has encouraged research using pairs, teams of three, and groups of five. Many studies have been conducted under his guidance. He con-

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[1]Donald D. Durrell, Improving Reading Instruction (New York: World Book Company, 1956), p. 129.

[2]Arthur I. Gates, "Implications of the Psychology of Perception for Word Study," Education (May, 1955), 75:593.

[3]Leonard Koos, "Individualization Within the Teaching Group," School Review (April, 1933), 41:4:245.

[4]James E. McDade, "Individual Learning in an Integrated School Program," Chicago Schools Journal (January-June, 1933), 15:58-67.

tends that "There is seldom any type of learning which is not enhanced by children working in pairs." He adds, however, that other groupings are useful, and suggests, "Children may be grouped or paired by the teacher so that one child does not continually lean on others to get his work done."[1]

McKim also proposes that the sizes of groups should be varied, depending upon the learning task.[2]

Gray has found that added motivation and increased proficiency can be achieved in many areas through the use of small groups:

> Experience shows very clearly that pupil development cannot always be achieved most effectively as the child works alone. Of great importance is the stimulus and added insight which result when he works cooperatively with others in achieving common goals.[3]

Experiments in Team Learning

Experimentation in team learning has not been widespread; yet studies which have been conducted reflect findings which should encourage a wide area of research.

An early experiment in grouping was carried on with arithmetic problem solving. Children in grades four and six were tested to determine whether they worked better in pairs or alone. Klugman found that ". . . when children worked in pairs they earned reliably higher scores

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[1]Durrell, op. cit., pp. 129-130.

[2]Margaret McKim, Guiding Growth in Reading (New York: The Macmillan Company, 1955), p. 326.

[3]William S. Gray (compiler and editor), Classroom Techniques in Improving Reading (Chicago: University of Chicago Press, 1949), p. 23.

than when they worked independently."[1]

Jones prepared graded study guides for use in paired practice in sixth grade social studies, with 545 children comprising the population of the study. She concluded, "Study guides were looked on with favor by both teachers and children. Pupils delighted in the experiences in paired practice, and teachers unanimously reported satisfaction in the use of this multiple-recitation technique."[2]

Bradley found that pairing techniques in the team-learning structure were conducive to growth when used with most second grade pupils. However, slow learners were somewhat handicapped by being placed together.[3]

Campanero, in her study using team learning for organization and recall skills in grade four, found a rewarding mutual aid between children who worked together. Her results indicated growth in social relationships, as well. Slow learners who worked together were inclined to become discouraged and little progress was made.[4]

In a study on word analysis using pairs in the experimental

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[1]Samuel F. Klugman, "Cooperative versus Individual Sufficiency in Problem Solving," Journal of Educational Psychology (February, 1944), 35:91-100.

[2]Annie Lee Jones, "Graded Study Guides for Sixth Grade Social Studies" (unpublished Doctoral dissertation, Boston University, Boston, 1958).

[3]Mary A. Bradley, "The Construction and Evaluation of Exercises for Providing Meaningful Practice in Second Grade Reading" (unpublished Doctoral dissertation, Boston University, Boston, 1957).

[4]Lena Campanero, "Graded Lessons for Use of Study Teams: Grade Four" (unpublished Master's thesis, Boston University, Boston, 1956).

group on constructed material, Catterson found statistically significant gains at the .01 level of confidence in favor of the experimental group in reading achievement. She found higher significance for her paired groups in speed of reading, vocabulary, word pronunciation, and visual memory.[1] According to Catterson:

> The pressure of numbers of children, increased emphasis on social development, the addition of subject matter to the curriculum, and the demand for greater efficiency among classroom teachers has meant that much attention has been directed of late to the development of improved materials and techniques for the classroom. There has been, therefore, much interest and research in the area of team learning, self-direction, and subject grouping, as modes of saving teacher and pupil time, and improving pupil achievement.[2]

McHugh conducted a study in Dedham, Massachusetts, ". . . to initiate and evaluate methods for adapting instruction in the intermediate grades to the learning needs of children in reading, arithmetic, spelling, and language."[3] Specific areas of investigation were:

1. Reading: silent and oral reading, word and study skills, comprehension, and correction of reading difficulties.
2. Arithmetic: meaning, computation, problem solving, and skills.
3. Spelling: mastery of spelling words in text, word meaning and imagery, transfer of spelling words to writing, and personal spelling lists.
4. Language: outlining, creative writing, proofreading, usage, and mechanics of writing.[4]

In the program of individualized instruction, McHugh compared

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[1]Jane H. Catterson, "Inductive Versus Deductive Methods in Word Analysis in Grade Five" (unpublished Doctoral dissertation, Boston University, Boston, 1959), pp. 148-154.

[2]Ibid., p. 37.

[3]McHugh, op. cit., p. 53.

[4]Ibid.

an experimental population and a control population. The experimental group comprised all children and classrooms in the intermediate grades in the 1958-1959 school year; the control group consisted of all children and classrooms in the intermediate grades in the 1957-1958 school year. Each teacher served as his own control. In measuring the average achievement, McHugh found:

1. Grades five and six made gains which were statistically significant.
2. At fourth grade level the mean gain of .59, with a standard error of 1.29, resulted in a critical ratio of .46, which was not statistically significant.
3. At fifth grade level the mean gain of 4.74, with a standard error of 1.31, resulted in a critical ratio of 3.62, which was statistically significant at the .01 level.
4. At sixth grade level the mean gain of 2.60, with a standard error of 1.31, resulted in a critical ratio of 2.60, which was statistically significant at the .01 level.[1]

Manning also conducted a program of individualized instruction in the Dedham schools ". . . to provide maximum learning opportunities in the content subject areas of social studies, literature, and science within the framework of the regular classroom."[2]

The experimental group for this study comprised pupils in the fifth and sixth grades in the Dedham schools in the 1958-1959 school year. The control group comprised all children and classrooms in the intermediate grades in the 1957-1958 school year. Twenty-three teachers served as their own controls. Only grades five and six were used in the

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[1]McHugh, op. cit.

[2]John Chorlton Manning, "Evaluation of Growth in the Content Subject Areas of Literature, Social Studies, and Science in a Program of Individualized Instruction" (unpublished Doctoral dissertation, Boston University, Boston, 1960), p. 180.

evaluation of this program. No data are provided for grade four. Manning reported the following results for the total population:

> 1. For grades five and six there was a slight difference favoring the experimental population in combined social studies; however, the difference was not statistically significant.
> 2. In grades five and six there were highly significant critical ratios favoring the experimental group in the comparison of literature mean achievement scores.[1]

Pertinent to the current study, Manning's data revealed that "In geography the experimental population was significantly superior to the control group. At both the fifth and sixth grade levels the individualized instruction groups showed gains statistically significant at the .01 level of confidence."[2]

Jameson's earlier findings on children's preferences tend to be substantiated in current studies. Her intent was to determine how children prefer to carry out assignments and to discover ways children enjoy working to the best advantage of their interests. She wrote:

> 1) In almost all cases the difference between partner participation and group participation is slight, but most of the groups prefer partner participation;
> 2) individual participation is chosen least of all by all groups;
> 3) the groups with below average Mental Age and high Mental Age of each grade show variations, i.e. children with low Mental Age prefer guidance rather than independence and children with high Mental Ages for a grade prefer to work independently or in larger groups.[3]

Culliton conducted a study ". . . to determine the effect on re-

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[1]Manning, op. cit., p. 183. [2]Ibid., p. 184.

[3]Vivian Jameson, "Children's Preferences in Types of Assignments" (unpublished Master's thesis, Boston University, Boston, 1951).

tention of expository material using different size discussion groups."[1] The material was developed for individuals, pairs, teams of three and groups of five. He found that the size of the group appeared to be a factor in retention. Results of this study indicated that children showed greater retention of the material when they worked in groups of three.

In Phase I of this study, four stories were read silently by the pupils, four stories were read orally to the pupils by the teacher, and four films were watched by all. Three sets of questions were written for each lesson, consisting of short answer, multiple choice, or multiple answers. Culliton found:

> Retention was better when pupils worked in groups of three. The difference between the individual and the group of three was significant at the .01 level of confidence. Although the differences between groups of two and three and three and five were not statistically significant, each favored the group of three.[2]

In Phase II of the study, four stories were read silently and four stories were read orally to the pupils by the teacher. Two sets of questions were written for each of the lessons, one requiring elaborative thinking, the other critical thinking. In Phase II, Culliton found:

> Retention was greatest when children worked in groups of three. The difference between the individual and the group of three, and groups of three and five were both statistically

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[1]Thomas E. Culliton, Jr., "Group Size in Relation to the Discussion Tasks in Learning" (unpublished Doctoral dissertation, Boston University, Boston, 1961).

[2]Ibid., p. 117.

> significant at the .01 level of confidence. The difference between groups of two and three was not statistically significant but favored the groups of three.[1]

The application of grouping techniques to content area subjects is gradually being accepted in elementary school programs. Jarolimek cautions that ". . . the question today is not one of whether there are to be provisions for individual difference but how the adjustments and adaptations should be made within the frame-work of the self-contained elementary classroom."[2]

Drummond and Sloan have suggested a possible approach: "It is frequently helpful to divide the class into groups for the map and globe study following each unit. At times, you may find it more valuable to have each child work individually with a map."[3]

Michaelis, too, emphasizes the need for experimentation with the current techniques of grouping for instruction in the social studies: "The success of the social studies program depends to a large degree upon the teacher's skill in developing and utilizing group processes in each unit of work that is developed."[4]

There remains a vast need for further research into grouping for instruction. Culliton writes:

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[1]Culliton, op. cit.

[2]Jarolimek, op. cit., p. 107.

[3]Harold D. Drummond and Fred A. Sloan, Jr., Teachers' Manual for A Journey Through Many Lands, Stull-Hatch Series (Boston: Allyn and Bacon, Inc., 1960), p. 7.

[4]Michaelis, op. cit., p. 158.

> Team learning is only one of a large cluster of elements which may be used to improve the amount and quality of learning. It may combine with any of a number of types of motivation, assignments, arrangements, enrichments, teaching aids and classroom and school organization. In order to evaluate its merits separately, a number of experimental designs may be made in which all motivating and structural factors may be held constant, with individual versus team activity being the independent variable.[1]

Current research recommends further study in specific areas of the curriculum to determine the effects of teams on learning.

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[1]Culliton, op. cit., p. 120.

CHAPTER II

PLAN OF THE STUDY

The purpose of this study was to develop a planned program in social studies to teach basic map skills in the fourth grade, using varied-size groups. The map skills lessons were self-directed and were evaluated on the basis of their use by individuals, pairs, and teams of three.

A population was secured which provided three experimental groups and a control group. These classes were within a cooperating school system which was willing to allow the experimental classes to devote approximately six weeks to an intensive program in map skills instruction. The approach to the lessons in the experimental groups was through team-learning. All formal social studies instruction was delayed until after the map skills lessons were completed. Since the lessons were self-directed, the teachers of experimental classes provided no implementation to the lessons. All map skills learning during the teaching phase of the study was derived from the planned lesson sheets and activities.

The Control Group followed the prescribed program in social studies at the fourth grade level.

Standardized tests were selected to measure intelligence and to determine map skills knowledge at the initial phase of the study. Tests on the planned map skills lessons and on social studies factual knowledge were constructed.

Retention and achievement were measured at the close of the experimental teaching period, at a delayed testing in June, and at a second delayed testing in September, after the summer vacation.

Many available resources were analyzed to select the map skills which were included in the lessons. Since the teaching lessons were so important to the plan of the study, they have been presented separately in Chapter III.

Development of the plan. The social studies textbooks being used in the various fourth grade classes, as well as current fourth grade social studies textbooks and recent publications, were analyzed to ascertain the terminology and concepts that were included in the study.

Lessons were constructed for a self-directed activity program. Each set of lessons taught new map skills and reviewed map skills of previous lessons. There was no inclusion of any social studies factual data in the experimental teaching lessons. This was an intensive program of map skills instruction, with all social studies facts and textbook references delayed until the end of the experimental teaching period.

In order to make the lessons self-directed, answer keys were provided on the back of lesson sheets, which included activity exercises. Every child, whether he was assigned to work alone, in a pair, or in a team of three, maintained a folder of completed lessons so there could be a reference for review. Time limitations were set on a weekly lesson pattern. Children in the experimental groups who were able to complete

the week's assignment were encouraged to review, to refer to maps and globes in the classroom, and to utilize supplementary references for self-enrichment. Sufficient time was allotted for the children in the study to complete the week's work sheets. Teachers were advised to maintain flexibility in groupings, to allow for pupil absence and to be alert to the social aspects of team learning.

To avoid teacher variability, no teaching and no correcting were done by the teacher. The plan of the experiment specified that the teacher was to provide no assistance in relation to the map concepts during the experimental teaching period. The major responsibilities of the teacher were to arrange heterogeneous groups for the pairs and teams of three, to see that the groups were performing effectively, and to assist in vocabulary recognition when an individual or group seemed unable to read a new word. Since formal instruction in the use of the dictionary did not begin until later in the fourth grade, it was not feasible to recommend dictionary usage for word analysis.

Selection of the population. Permission to conduct the study was readily granted by the superintendent of schools of an industrial city within a twenty-five-mile radius of Boston. Approval was given on the plan to use twenty-five of the forty-four fourth grade classes in the school system.

The writer met with the elementary supervisor of Grades Four, Five, and Six to select the teachers who would be invited to participate in the study. Selections were based on teacher ability, cooperativeness, flexibility to adjust to the team-learning approach, and

the relative location of the school within the city in order to provide for a diversity of backgrounds. Principals were contacted for approval to permit classes within their schools to partake in the study. Twenty-seven teachers were invited to participate; however, twenty-five teachers were finally included in the initial plan.

A meeting with the selected teachers and principals, representing eleven elementary schools, was held on October 5, 1960. Copies of the plan of the study were presented and their cooperation was requested. A sample of the lessons was distributed to all present and a demonstration was conducted to show the varied-size groups at work on the lessons --individuals, pairs, and teams of three.

When a school had more than one fourth grade classroom participating in the study, all of the classes were either control or experimental.

Description of the groups. The population was divided into four groups. The Control Group continued on the prescribed social studies program of the school system. Map skills were introduced as they appeared in the textbook or in the general course of study. No deviation from the regular program was made. Forty minutes per day were devoted to the teaching of social studies.

There were three experimental groups, which will henceforth be designated as Experimental Group I, Experimental Group II, and Experimental Group III.

Children in the three experimental groups received the same self-directed map skills lessons and worked on them without teacher aid.

These children had no additional instruction in social studies throughout the length of the teaching phase of the study. Forty minutes per day, the prescribed time allotment for the social studies period, were allowed for the lessons.

The three experimental groups differed in that the children in Experimental Group I worked on the lessons alone; those in Experimental Group II worked in pairs; and those in Experimental Group III worked in teams of three.

The small groups were assigned by the classroom teacher.

Administration of the initial tests. The initial tests were administered by the classroom teachers during the week of October 10, 1960 to 766 children in the twenty-five classes. To assure uniformity in the administration of the tests, directions and samples were given to each teacher with individual instructions.

The initial research instruments used in this study consisted of the following:

1. Kuhlmann-Anderson Intelligence Test[1]
2. Iowa Tests of Basic Skills--Map Reading section[2]

c. Map Skills Test

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[1]F. Kuhlmann and Rose G. Anderson, Kuhlmann-Anderson Intelligence Tests, Form C (Princeton, New Jersey: Personnel Press, Inc., 1952).

[2]E. F. Lindquist and A. N. Hieronymus, Iowa Tests of Basic Skills, Form I and Form II (Boston: Houghton Mifflin Company, 1956).

Kuhlmann-Anderson Intelligence Test

The Kuhlmann-Anderson Intelligence Test (Form C) was administered by the participating school system as part of their regular testing program. Results were recorded directly from the Class Record Sheet. For the purpose of this study, chronological ages and mental ages were used in equating the population. Data were based on an October 1, 1960 testing date.

Purpose. The purpose of the Kuhlmann-Anderson Intelligence Test is stated in the manual as "the measurement of mental development of school-age children and young people . . . in order to estimate their capacities for learning."

Validity. The validity of the Kuhlmann-Anderson Intelligence Test is based on: (1) data that show their power to discriminate among successive levels of chronological age by comparing the scores of successful pupils with the scores of less successful ones; (2) data on intercorrelation among the subtests in the scales and between subtests scores and total scores; and (3) reports of results of researchers who have used the test.

Allen reports concurrent validity evidence of correlations of .66 to .84 with a "widely used achievement test."[1]

Dearborn and Rothney provide congruent validity evidence. They found the median I.Q. obtained in three administrations of Kuhlmann-

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[1]Mildred M. Allen, "The Relation Between Kuhlmann-Anderson Tests and Achievement in Grade IV," Journal of Educational Psychology (1944), 35:229-239.

Anderson Tests agreed exactly, or within one or two points, with the median I.Q.'s obtained by three administrations of the most widely used individual test of mental ability.[1]

Reliability. The reliability of this test is described by Garrett:

> The reliability of the test is high in terms of the split-half coefficient and the standard error of a score (5.5 points of I.Q.) compares favorably with the same error of measurement in the 1937 Stanford-Binet.[2]

Split-half reliability coefficients for the Kuhlmann-Anderson Intelligence Test are based on total raw scores for 100 pupils in each grade group under both timed and untimed conditions:

Grade	Timed r	Untimed r
3	.95 ± .01	.89 ± .02
5	.94 ± .01	.92 ± .02
7	.96 ± .01	.95 ± .02
9	.97 ± .01	.97 ± .01

These scores were corrected by the Spearman-Brown formula.

Description of the test. There are nine forms to the Kuhlmann-Anderson Intelligence Tests, ranging from kindergarten usage (Form K) through high school usage (Form H). Each of the battery booklets contains ten tests. A median score of the ten tests in the booklet provides a child's mental age.

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[1]Walter F. Dearborn and John W. M. Rothney, Predicting the Child's Development (New York: Sci-Art Publishers, 1941).

[2]Henry E. Garrett, The Fourth Mental Measurements Yearbook, ed. Oscar K. Buros (Highland Park, New Jersey: Gryphon Press, 1953).

Segal describes the Kuhlmann-Anderson Intelligence Tests as one of the "best all around group intelligence tests that give an overall mental age." He considers them "unique in use of medial mental age scores on separate tests to arrive at Mental Age of pupils, thus obtaining I.Q.'s less affected by extreme scores on any subtest caused by some extraneous influence."[1]

Norms. The norms for this test were established on more than 30,000 school children in the various grades. These children were "representative of the country as a whole."[2]

Iowa Tests of Basic Skills

The Map Reading section of the Iowa Tests of Basic Skills was selected as an instrument to measure knowledge of map skills. Although the test included 89 items ranged in a graded progression of difficulty from grades three to nine, time limits and grade boundaries were disregarded for the purpose of this study. Teachers were instructed to permit their classes to begin on Item I and to continue as far as they were able to with a maximum amount of time provided.

Purpose. The Iowa Tests of Basic Skills provide for "the measurement, at the third- to the ninth-grade levels, of certain skills involved in reading, work-study, language, and arithmetic." The purpose of this test is to: "(1) enable teachers and school officials to be-

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[1]David Segal, The Fourth Mental Measurements Yearbook, ed. Oscar K. Buros (Highland Park, New Jersey: Gryphon Press, 1953).

[2]Ibid.

come more quickly and dependably acquainted with the educational accomplishments and abilities of each pupil, in order that instruction and guidance may be better adapted to his individual needs, interests, and abilities; (2) supply the teacher, counselor, pupil and parent with important information needed for effective educational guidance; and (3) provide the school official with an objective and dependable basis for the evaluation of school and class achievement."[1]

Validity. The authors of the Iowa Tests of Basic Skills recommend that the validity for the instrument should be primarily face validity; that is, the close scrutiny of the examination and the determination of its value for the tester's particular situation.

Reliability. The reliability coefficients for this test are presented for each subtest at every grade level from three through eight. Since only the Map Reading section of the Iowa Tests of Basic Skills was used in the study, the reliability coefficients for this phase are reported.

Grade	Reliability Coefficient
3	.70
4	.84
5	.84
6	.81
7	.76
8	.73

Description of the test. There are two forms of the multilevel edition for Grades 3-9 of the Iowa Tests of Basic Skills. Form I and Form II test the following:

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[1]Lindquist and Hieronymus, op. cit.

Vocabulary
Reading
Language
  Spelling
  Capitalization
  Punctuation
  Usage
Work-Study Skills
  Map Reading
  Graphs and Tables
  References
Arithmetic
  Arithmetic Concepts
  Problem Solving

The Map Reading section of the Work-Study Skills was used in this test. There are 89 multiple choice items for grades three to nine. The children were allowed to start at the beginning of the Map Reading section of the test and to proceed as far as they were able; therefore, grade equivalents could not be used in the analysis of data.

Norms. The population on which the norms for this test are based includes, at each of grades three to nine, children in regular daily attendance at public schools throughout the United States. A total of 74,174 pupils from 213 school systems in 46 states were included in the normative sample.

Map Skills Test

Purpose. A map skills test was constructed by the writer to determine: (1) knowledge of map skills at the initial phase of the study and before the teaching of the lessons; (2) the amount of learning achieved at the end of the intensive program of instruction; (3) retention and implementation of map skills through May of the academic year on a delayed testing; and (4) retention of knowledge after the

summer vacation on a second delayed test.

Description of the test. The test included 53 items, each of which had four multiple choice answers. Responses were made on an answer sheet. The test was administered to each child in the study at four separate times by the classroom teachers. All answer sheets were hand-scored by the writer.

Questions were prepared from the major concepts contained in the lessons. This factor provided for curriculum validity.

Items tested knowledge of:

Cardinal directions
In-between directions
Earth concepts
Continents and oceans
Spheres and hemispheres
Imaginary lines
Time zones
Pattern map reading
Diagram reading
Geographic terminology

All items that were not covered in detail within the lessons were eliminated from the Map Skills Test. Social studies factual data had to be omitted from the Map Skills Test.

The tests were analyzed for mean and standard deviation as measures of central tendency.

Reliability. Reliability on the Map Skills Test has been established by the split-half technique with correlation computed by the Pearson product-moment method and corrected by applying the Spearman-Brown prophecy formula. The reliability for this test had been established on the population used in the current study. The reliability coefficient was based on 100 random cases arranged from the highest to

lowest scores of the total population. The initial Map Skills Test was used to establish the corrected reliability coefficient of .933.

The reliability coefficient was determined by the following formulas:

Pearson Product-Moment

$$r = \frac{\sum xy - \frac{\sum x \sum y}{N}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{N}} \sqrt{\sum y^2 - \frac{(\sum y)^2}{N}}}$$

Spearman-Brown

$$r = \frac{2(rxy)}{1 + rxy}$$

A copy of the Map Skills Test may be found in the Appendix.

Equating of groups. Seven classes with a population of 203 were designated as the Control Group; six classes with 188 as Experimental Group I; six classes with 183 as Experimental Group II; and six classes with 192 as Experimental Group III. A total of 766 children participated in the initial phases of the study. Heterogeneous grouping prevailed in all of the classrooms.

The groups were equated on the basis of means of Chronological Age, Mental Age, the Map Reading section of the Iowa Tests of Basic Skills (Form II), and the Map Skills Test constructed by the writer.

Time schedule for the study. In all experimental classes, work began on the lessons on October 17, 1960. Visits to the experimental classes were made during that week and subsequent weeks. When special

requests for help were made, it was possible to follow these up at once.

New weekly lessons were delivered each Monday morning. The teachers in the experimental classes were instructed to allow 40 minutes per day, or 200 minutes per week, the time ordinarily allotted to social studies, for the map skills lessons. No additional social studies instruction was to be carried on during the use of the map skills lessons in these classes.

The following schedule for the experimental classes was maintained:

October 10 through October 14, 1960	Preliminary Testing
October 17 through October 21, 1960	200 minutes
October 24 through October 28, 1960	200 minutes
October 31 through November 4, 1960	200 minutes
November 7 through November 10, 1960	160 minutes
November 14 through November 18, 1960	200 minutes
November 21 through November 23, 1960	120 minutes
Total working time	1080 minutes

November 28 through December 2, 1960	Final Testing
June 5 through June 9, 1961	Delayed Test A
September 25 through September 29, 1961	Delayed Test B

The testing schedule for the Control Group was the same as that set up for the Experimental Groups:

October 10 through October 14, 1960	Preliminary Testing
November 28 through December 2, 1960	Final Testing
June 5 through June 9, 1961	Delayed Test A
September 25 through September 29, 1961	Delayed Test B

Testing at the close of the teaching period. The teaching lessons were concluded on November 23, 1960. The experimental population had worked on the lessons for 27 days and had spent 40 minutes per day on the work sheets. The total time spent was 1,080 minutes, or 18 hours,

over a period of five and one half weeks. This was equivalent to the time allotted to social studies on the regular program as prescribed by the participating school system.

At the end of this period all children were administered the Map Reading section of the Iowa Tests of Basic Skills, Form I, as well as the Map Skills Test. Illness, transfers, and drop-outs reduced the number of children to 748.

Administration of the delayed testing in June. During the week prior to June 5, 1961, teachers of both control and experimental groups were notified that a retention test would be administered. This information had been withheld so that no additional practice would be provided. These tests included the Map Reading section of the Iowa Tests of Basic Skills, Form II, and the Map Skills Test. At this time, a Social Studies Fact Test was also administered.

Although the initial tests had been administered to 766 children in the twenty-five classrooms, illness, transfers, drop-outs, and equating procedures reduced the number of children to 570: 154 in the Control Group; 137 in Experimental Group I; 146 in Experimental Group II; and 133 in Experimental Group III. All statistics for the initial testing, the testing at the close of the experimental teaching period, and the delayed testing in June were determined on the basis of this population.

Social Studies Fact Test

Purpose. A Social Studies Fact Test was constructed by the writer for administration during the two delayed testing phases of the

study. The Social Studies Fact Test was to be administered in June of the academic year of the study and the following September. The purpose of this test was to determine what effect the concentrated, intensive map skills program had upon the experimental groups and to compare the social studies learning of the experimental and control groups. Since the experimental group had no social studies instruction for a period of five and one half weeks during the map skills lessons, it was necessary to determine how this group compared to the control group which followed the prescribed curriculum and studied map skills as they appeared in the textbook.

Description of the test. The Social Studies Course of Study for the participating system was used as a basis for the form of the test. All textbooks being used within the school system were examined to ascertain common usage of vocabulary. The selection of items from the material covered during the academic year provided curriculum validity.

Areas which made up the units of study in the fourth grade Course of Study included:

United States
Local community
Jungle
Desert
Far North
Netherlands
Switzerland
Norway

A total of 153 items was included. Each area appeared on a separate page. Items included matching, true-false, multiple choice, and categorizing. The last three pages of the test measured recognition of facts pertinent to groups of the aforementioned areas of study.

The tests were administered by the classroom teachers. Directions were prepared and given to the teachers prior to each testing session. No time limit was established in order to allow greatest efficiency within a maximum time allotment.

All tests were hand-scored by the writer.

Reliability on the Social Studies Fact Test. Reliability on the Social Studies Fact Test has been established by the split-half technique with correlation computed by the Pearson product-moment method and corrected by applying the Spearman-Brown prophecy formula. The reliability for this test has been established on the population used in the June retention test, known as Retention Test A, in the current study. The reliability coefficient was based on 100 random cases from the total of 570, arranged from the highest to the lowest scores. The corrected reliability coefficient was .872.

The reliability coefficient was determined by the following formulas:

$$r = \frac{\sum xy - \frac{\sum x \sum y}{N}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{N}} \sqrt{\sum y^2 - \frac{(\sum y)^2}{N}}}$$

Pearson Product-Moment

$$r = \frac{2(rxy)}{1 + rxy}$$

Spearman-Brown

Sample items of the Social Studies Fact Test follow.

Administration of the delayed testing in September. On September 25, 1961, a retention test was given to all children in the previous school year's study to determine retention after the summer's vacation. All children in the study were readministered the Map Read-

ing section of the Iowa Tests of Basic Skills, Form I, the Map Skills Test, and the Social Studies Fact Test. Due to illness, summer transfers, and summer drop-outs, the data for the September retention test included 521 children: 144 in the Control Group; 124 in Experimental Group I; 132 in Experimental Group II; and 121 in Experimental Group III.

Pupil questionnaire. A pupil questionnaire was distributed at the end of the teaching period to all children in the experimental population. This questionnaire was developed to ascertain the reaction of the pupils to the map skills lessons and the social aspects of working in small teams. The questionnaire follows.

To the pupil: Now that the lessons in map skills have been completed, I would like to have you answer some questions for me.

1. Which team did you work in?

   _____ alone

   _____ pairs

   _____ groups of three

2. a. Do you think team work is fun? (Answer if you worked in twos or threes)

   _____

   _____

   b. Why? _____

   _____

3. Have you new friends because you worked with them in groups?

   _____

   _____

4. a. Did you enjoy these lessons? _____

   b. Why? _____

5. Have you found map work easier because of these lessons?

   _____

   _____

6. Would you rather have the teacher explaining the work and correcting papers or did you like learning from the lessons, doing the activity and correcting your own work?

   _____

   _____

7. a. Do you think you would like to try team work in other subjects? _____

   b. Why? _____

   _____

8. a. Have you done any map work in your spare time in school or at home? _____

   _____

   b. What kind? _____

   _____

9. Have you used any maps recently that you were able to read because of these lessons? _____

   _____

Results of the questionnaire will be found in the Analysis of Data chapter.

Teacher evaluation form. A form was distributed to all teachers in the experimental group to determine their reaction to the lessons and to the team-learning approach in Social Studies.

The questionnaire follows.

Teacher Participant Evaluation Scale

1. Did you enjoy being a part of the map skills experiment? _____

2. a. If so, what feature of the study did you enjoy most?

_____

_____

_____

b. What feature of the study did you enjoy least?

_____

_____

_____

3. Could you offer any suggestions for the improvement of these lessons?

_____

_____

_____

4. Which size group was your class involved in?

_____ working alone

_____ working in pairs

_____ working in teams of three

5. Have you ever had small team work before? _____

6. If so, in what subject areas have you had children working in pairs

or teams of three?

_____

_____

_____

7. Do you think you will continue team work in the area of social studies? _____

8. In what other areas would you like to try team work?

_____

9. Did you notice social improvement in the behavior patterns of the children?

_____

_____

10. Were any groups ineffective? _____

11. If so, in what ways?

_____

_____

_____

12. Have you noticed any changes of attitude toward map skills in the total class scene due to the intensive study?

a. Yes _____

_____

_____

b. No _____

_____

_____

13. a. Have children in your class shown initiative beyond the lessons to do extra map work? _____

_____

b. What kind? _____

_____

14. Do you intend to use these lessons to supplement your textbook study of maps throughout the year? _____

15. Have you found children using maps and globes more freely than previous classes had? _____

_____

16. Do you have the following equipment in your classroom?

a. Wall maps _____

b. Globe _____

c. Encyclopedia _____

d. Atlas _____

e. Social Studies text Name: _____

Publisher: _____

Date of Publication: _____

f. Supplementary texts for social studies _____

_____

17. Do you use any of the following in social studies lessons?

a. Sound Projector _____

b. Filmstrip Projector _____

c. Opaque Projector _____

d. Phonograph _____

e. Tape Recorder _____

Results of the teacher evaluation will be found in the Analysis of Data chapter.

CHAPTER III

DEVELOPMENT OF THE LESSONS

In order to conduct the study, it was necessary to develop a series of lessons for a planned program in social studies to teach basic map skills in the fourth grade using varied-size groups.

The development of the lessons was initiated with an extensive review of the literature to determine the map skills most common to the fourth grade curriculum. All of the map skills which are usually introduced at the fourth grade level had to be considered in order to develop a concentrated and intensive program.

The map skills which were suggested in the review of research were matched with map skills which appeared as goals of current fourth grade social studies textbooks and various courses of study.

Since the prepared lessons were to be used in a particular community, it was then necessary to ascertain if the map skills were ordinarily introduced in the fourth grade classes of the cooperating school system. It was found that the participating school system used a multi-text program in social studies, with textbooks ranging from a 1928 publication date to a 1955 publication date. Some of the schools were using the same textbooks, although revised editions appeared in certain classes in the study.

Textbooks within the fourth grade classes of the participating school system and the publication dates of textbooks being used included the following:

CHAPTER IV

ANALYSIS OF DATA

The purpose of this study was to develop and evaluate a planned program in social studies to teach basic map skills in the fourth grade using varied-size groups--individuals, pairs, and teams of three.

The data were analyzed to determine:

1. The size group which produces the greatest amount of map skills learning
2. The size group which shows the greatest amount of retention
3. The size group which shows the greatest amount of social studies fact knowledge
4. The effect of the map skills lessons upon children of different intelligence levels and between boys and girls
5. The evaluation made by the children and teachers of the procedures.

A total of 570 children comprised the four groups on which the data were based.

The Control Group followed their prescribed Course of Study in social studies with no deviation in the instructional program.

Children in Experimental Groups I, II, and III received the same self-directed map skills lessons for twenty-seven days. However, children in Experimental Group I worked on the lessons alone; children in Experimental Group II worked in pairs; and children in Experimental Group III worked in teams of three. There was no teacher aid provided.

All formal social studies instruction was delayed until the close of the teaching phase of the study.

All tests used in the evaluation of pupils were hand-scored. The statistical procedures used in analyzing the data were measures of central tendency and variability. The critical ratio between means was used to determine the level of confidence; the .01 level of confidence was used to reject the null hypothesis.

The groups were equated on chronological age, mental age, the Map Reading section of the Iowa Tests of Basic Skills, and the Map Skills Test.* Tables 1 through 8 show the results of the equating.

Table 1 shows the distribution of chronological ages in months for the four groups in the study.

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*The Map Skills Test was constructed by the writer. A copy of this test may be found in the Appendix.

TABLE 1

DISTRIBUTION OF CHRONOLOGICAL AGES

Ages in Months	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
138 - 140	2		1	2
135 - 137	2		3	1
132 - 134	2	2	2	1
129 - 131	1	3	3	3
126 - 128	4	5	7	3
123 - 125	6	6	4	7
120 - 122	6	5	5	4
117 - 119	11	13	9	8
114 - 116	9	10	5	11
111 - 113	26	23	17	19
108 - 110	33	22	23	26
105 - 107	22	15	32	18
102 - 104	16	22	22	21
99 - 101	14	11	13	9
N	154	137	146	133
Mean	111.34	111.34	111.37	111.37
S.D.	8.40	8.04	8.94	8.52

The chronological ages in the Control Group, Experimental Group II, and Experimental Group III ranged from 99 to 140 months, or 8 years-3 months to 11 years-8 months, with means of 111.34, 111.37, and 111.37 months and standard deviations of 8.40, 8.94, and 8.52, respectively.

The chronological ages in Experimental Group I ranged from 99 to 134 months, or 8 years-3 months to 11 years-2 months, with a mean of 111.34 months and a standard deviation of 8.04.

Table 2 shows the comparison of chronological ages for the four groups.

TABLE 2

COMPARISON OF MEAN CHRONOLOGICAL AGES

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	111.34	8.40	.677	.00	.96	.00
Exp.Grp. I	137	111.34	8.04	.687			
Control	154	111.34	8.40	.677	.03	1.00	.03
Exp.Grp.II	146	111.37	8.94	.740			
Control	154	111.34	8.40	.677	.03	1.00	.03
Exp.Grp.III	133	111.37	8.52	.739			
Exp.Grp.I	137	111.34	8.04	.687	.03	1.01	.03
Exp.Grp.II	146	111.37	8.94	.740			
Exp.Grp.I	137	111.34	8.04	.687	.03	1.01	.03
Exp.Grp.III	133	111.37	8.52	.739			
Exp.Grp.II	146	111.37	8.94	.740	.00	1.05	.00
Exp.Grp.III	133	111.37	8.52	.739			

The chronological ages of pupils in the four groups were comparable, showing that the groups had been equated on this measure.

Table 3 shows the distribution of mental ages in months for the four groups in the study.

TABLE 3

DISTRIBUTION OF MENTAL AGES

Ages in Months	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
141 - 143	2		1	1
138 - 140	1	2	1	
135 - 137	2	2	2	2
132 - 134	3	3	5	4
129 - 131	6	6	6	6
126 - 128	4	16	9	17
123 - 125	26	10	23	15
120 - 122	27	19	21	19
117 - 119	18	22	12	15
114 - 116	24	15	20	7
111 - 113	20	22	18	16
108 - 110	15	14	19	19
105 - 107	2	2	6	8
102 - 104	4	4	3	4
N	154	137	146	133
Mean	118.55	118.50	118.37	118.36
S.D.	7.47	7.68	7.98	8.37

The mental ages in the Control Group, Experimental Group II, and Experimental Group III ranged from 102 to 143 months, or 8 years-5 months to 11 years-11 months, with means of 118.55, 118.37, and 118.36 months and standard deviations of 7.47, 7.98, and 8.37, respectively.

The mental ages in Experimental Group I ranged from 102 to 140 months, or 8 years-5 months to 11 years-8 months, with a mean of 118.50 months and a standard deviation of 7.68.

Table 4 shows the comparison of mean mental ages for the four groups.

TABLE 4

COMPARISON OF MEAN MENTAL AGES

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	118.55	7.47	.602	.05	.89	.06
Exp.Grp.I	137	118.50	7.68	.656			
Control	154	118.55	7.47	.602	.18	.89	.20
Exp.Grp.II	146	118.37	7.98	.661			
Control	154	118.55	7.47	.602	.19	.94	.20
Exp.Grp.III	133	118.36	8.37	.726			
Exp.Grp.I	137	118.50	7.68	.656	.13	.93	.14
Exp.Grp.II	146	118.37	7.98	.661			
Exp.Grp.I	137	118.50	7.68	.656	.14	.98	.14
Exp.Grp.III	133	118.36	8.37	.726			
Exp.Grp.II	146	118.37	7.98	.661	.01	.98	.01
Exp.Grp.III	133	118.36	8.37	.726			

The mean mental ages of pupils in the four groups were comparable, showing that the groups had been equated on this measure.

Table 5 shows the distribution of scores on the initial test of the Map Reading section of the Iowa Tests of Basic Skills (Form 2), for the four groups in the study.

TABLE 5

DISTRIBUTION OF SCORES ON THE INITIAL TEST OF THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS (FORM 2)

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
57 - 59			1	
54 - 56		1		
51 - 53				
48 - 50			1	
45 - 47		1		
42 - 44			3	1
39 - 41		2		4
36 - 38	1	4	3	2
33 - 35	9	7	6	8
30 - 32	14	8	5	8
27 - 29	15	8	18	12
24 - 26	22	22	14	13
21 - 23	22	14	15	18
18 - 20	26	20	21	17
15 - 17	18	20	30	21
12 - 14	19	19	20	16
9 - 11	5	8	7	6
6 - 8	1	1	1	4
3 - 5	2	1	1	3
0 - 2		1		
N	154	137	146	133
Mean	21.59	21.43	21.33	21.21
S.D.	6.93	8.49	8.46	8.40

The scores for the Control Group on the Map Reading section of the Iowa Tests of Basic Skills ranged from 3 to 38, with a mean of 21.59 and a standard deviation of 6.93; Experimental Group I, from 0 to 56, with a mean of 21.43 and a standard deviation of 8.49; Experimental Group II, from 3 to 59, with a mean of 21.33 and a standard deviation of 8.46; and Experimental Group III, from 3 to 44, with a mean of 21.21 and a standard deviation of 8.40.

Table 6 shows the comparison of mean scores on the initial test of the Map Reading section of the Iowa Tests of Basic Skills (Form 2), for the four groups.

TABLE 6

COMPARISON OF MEAN SCORES ON THE INITIAL TEST OF THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS (FORM 2)

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	21.59	6.93	.557	.16	.91	.18
Exp.Grp.I	137	21.43	8.49	.725			
Control	154	21.59	6.93	.557	.26	.89	.29
Exp.Grp.II	146	21.33	8.46	.700			
Control	154	21.59	6.93	.557	.38	.92	.41
Exp.Grp.III	133	21.21	8.40	.729			
Exp.Grp.I	137	21.43	8.49	.725	.10	1.01	.09
Exp.Grp.II	146	21.33	8.46	.700			
Exp.Grp.I	137	21.43	8.49	.725	.22	1.03	.21
Exp.Grp.III	133	21.21	8.40	.729			
Exp.Grp.II	146	21.33	8.46	.700	.12	1.01	.12
Exp.Grp.III	133	21.21	8.40	.729			

The mean scores in all groups were comparable with no statistically significant difference between any of the groups. This would indicate that the groups had been equated on this measure.

Table 7 shows the distribution of scores on the initial Map Skills Test for the four groups.

TABLE 7

DISTRIBUTION OF SCORES ON THE INITIAL MAP SKILLS TEST

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
48 - 50		1		
45 - 47				
42 - 44	1	2	2	1
39 - 41	3		1	2
36 - 38	3	4	4	4
33 - 35	3	7	5	5
30 - 32	7	12	8	7
27 - 29	11	15	9	12
24 - 26	28	18	15	12
21 - 23	29	12	34	20
18 - 20	24	13	24	23
15 - 17	25	20	23	27
12 - 14	11	12	12	16
9 - 11	7	14	6	3
6 - 8	1	6	2	
3 - 5	1			1
0 - 2		1	1	
N	154	137	146	133
Mean	21.55	21.41	21.39	21.39
S.D.	6.87	8.85	7.23	7.26

The scores for the Control Group on the initial Map Skills Test ranged from 3 to 44, with a mean of 21.55 and a standard deviation of 6.87; Experimental Group I, from 0 to 50, with a mean of 21.41 and a standard deviation of 8.85; Experimental Group II, from 0 to 44, with a mean of 21.39 and a standard deviation of 7.23; and Experimental Group III, from 3 to 44, with a mean of 21.39 and a standard deviation of 7.26.

Table 8 shows the comparison of scores on the initial Map Skills Tests for the four groups.

TABLE 8

COMPARISON OF MEAN SCORES ON THE INITIAL MAP SKILLS TEST

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	21.55	6.87	.554	.14	.94	.15
Exp.Grp.I	137	21.41	8.85	.756			
Control	154	21.55	6.87	.554	.16	.82	.19
Exp.Grp.II	146	21.39	7.23	.599			
Control	154	21.55	6.87	.554	.16	.84	.19
Exp.Grp.III	133	21.39	7.26	.629			
Exp.Grp.I	137	21.41	8.85	.756	.02	.96	.02
Exp.Grp.II	146	21.39	7.23	.599			
Exp.Grp.I	137	21.41	8.85	.756	.02	.98	.02
Exp.Grp.III	133	21.39	7.26	.629			
Exp.Grp.II	146	21.39	7.23	.599	.00	.87	.00
Exp.Grp.III	133	21.39	7.26	.629			

The means in all groups were comparable with no statistically significant difference between any of the groups. This would indicate that the groups had been equated on this measure.

The four groups were comparable on the basis of chronological age, mental age, the Map Skills section of the Iowa Tests of Basic Skills, and a Map Skills Test.

The experimental teaching period was conducted for twenty-seven days. It will be recalled that all experimental groups were given the same lessons; however, Experimental Group I worked as individuals, Experimental Group II worked in pairs, and Experimental Group III worked in teams of three. The Control Group followed the prescribed Course

of Study in social studies.

Table 9 shows the distribution of scores on the Map Reading section of the Iowa Tests of Basic Skills (Form 1), for the four groups at the end of the teaching period.

TABLE 9

DISTRIBUTION OF SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS (FORM 1) AT THE END OF THE EXPERIMENTAL TEACHING PERIOD

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
63 - 65				3
60 - 62		1		1
57 - 59			1	3
54 - 56		1		2
51 - 53		1		5
48 - 50		3	3	7
45 - 47		1	3	6
42 - 44		4	6	9
39 - 41	1	4	13	17
36 - 38	3	8	20	13
33 - 35	5	7	25	12
30 - 32	14	17	20	15
27 - 29	25	29	31	17
24 - 26	22	17	12	10
21 - 23	24	17	4	7
18 - 20	25	12	8	1
15 - 17	15	7		2
12 - 14	14	4		3
9 - 11	4	2		
6 - 8		1		
3 - 5	2	1		
N	154	137	146	133
Mean	21.42	27.65	32.46	36.13
S.D.	6.75	9.30	6.99	10.83

The scores for the Control Group on the Map Reading section of the Iowa Tests of Basic Skills ranged from 3 to 41, with a mean of

21.42 and a standard deviation of 6.75; Experimental Group I, from 3 to 62, with a mean of 27.65 and a standard deviation of 9.30; Experimental Group II, from 18 to 59, with a mean of 32.46 and a standard deviation of 6.99; and Experimental Group III, from 12 to 65, with a mean of 36.13 and a standard deviation of 10.83.

Table 10 presents a comparison of the mean scores on the Map Reading section of the Iowa Tests of Basic Skills at the close of the experimental teaching period for the four groups.

TABLE 10

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS (FORM 1) AT THE END OF THE EXPERIMENTAL TEACHING PERIOD

Group	No.	Mean	S.D.	S.E.m	Diff.m	S.E.d	C.R.
Control	154	21.42	6.75	.544	6.23	.89	7.00
Exp.Grp.I	137	27.65	9.30	.709			
Control	154	21.42	6.75	.544	11.04	.79	13.97
Exp.Grp.II	146	32.46	6.99	.579			
Control	154	21.42	6.75	.544	14.71	1.09	13.50
Exp.Grp.III	133	36.13	10.83	.939			
Exp.Grp.I	137	27.65	9.30	.709	4.81	.92	5.23
Exp.Grp.II	146	32.46	6.99	.579			
Exp.Grp.I	137	27.65	9.30	.709	8.48	1.18	7.19
Exp.Grp.III	133	36.13	10.83	.939			
Exp.Grp.II	146	32.46	6.99	.579	3.67	1.10	3.34
Exp.Grp.III	133	36.13	10.83	.939			

The mean score was 21.42 for the Control Group, 27.65 for Experimental Group I, 32.46 for Experimental Group II, and 36.13 for Ex-

perimental Group III.

A comparison of the mean scores shows all experimental groups have significant differences at the .01 level of confidence over the Control Group. An analysis of these data shows:

The difference between the Control Group and Experimental Group I was 6.23, with a critical ratio of 7.00; the difference between the Control Group and Experimental Group II was 11.04, with a critical ratio of 13.97; and the difference between the Control Group and Experimental Group III was 14.71, with a critical ratio of 13.50. All critical ratios in this comparison are highly significant at the .01 level of confidence, favoring the experimental groups.

The comparisons within the experimental groups show:

There was a difference of 4.81 between Experimental Groups I and II. The critical ratio of 5.23 indicates a significant difference at the .01 level of confidence, favoring Experimental Group II.

There was a difference of 8.48 between Experimental Groups I and III. The critical ratio of 7.19 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

There was a difference of 3.67 between Experimental Groups II and III. The critical ratio of 3.34 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

A comparison of the mean scores of the experimental groups indicates that the greatest gains were made by Experimental Group III, followed by Experimental Groups II and I, respectively.

Table 11 shows the distribution of scores on the Map Skills Test for each of the groups at the close of the experimental teaching period.

TABLE 11

DISTRIBUTION OF SCORES ON THE MAP SKILLS TEST AT THE END OF THE EXPERIMENTAL TEACHING PERIOD

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
51 - 53		5	10	14
48 - 50		9	18	25
45 - 47	2	14	18	21
42 - 44	3	15	29	20
39 - 41	4	22	27	18
36 - 38	4	12	20	15
33 - 35	5	14	10	8
30 - 32	11	17	5	6
27 - 29	19	11	5	5
24 - 26	19	5	3	
21 - 23	19	6	1	1
18 - 20	35	3		
15 - 17	21	2		
12 - 14	11	2		
9 - 11	1			
N	154	137	146	133
Mean	23.50	36.48	41.29	42.66
S.D.	7.59	8.94	6.54	6.18

The scores for the Control Group on the Map Skills Test ranged from 9 to 47, with a mean of 23.50 and a standard deviation of 7.59; Experimental Group I, from 12 to 53, with a mean of 36.48 and a standard deviation of 8.94; Experimental Group II, from 21 to 53, with a mean of 41.29 and a standard deviation of 6.54; and Experimental Group III, from 21 to 53, with a mean of 42.66 and a standard deviation of 6.18.

Table 12 presents a comparison of the scores on the Map Skills Test at the close of the experimental teaching period for the four groups.

TABLE 12

COMPARISON OF SCORES ON THE MAP SKILLS TEST AT THE END OF THE EXPERIMENTAL TEACHING PERIOD

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	23.50	7.59	.612	12.98	.98	13.24
Exp.Grp.I	137	36.48	8.94	.763			
Control	154	23.50	7.59	.612	17.79	.82	21.70
Exp.Grp.II	146	41.29	6.54	.541			
Control	154	23.50	7.59	.612	19.16	.81	23.65
Exp.Grp.III	133	42.66	6.18	.536			
Exp.Grp.I	137	36.48	8.94	.763	4.81	.94	5.12
Exp.Grp.II	146	41.29	6.54	.541			
Exp.Grp.I	137	36.48	8.94	.763	6.18	.93	6.65
Exp.Grp.III	133	42.66	6.18	.536			
Exp.Grp.II	146	41.29	6.54	.541	1.37	.76	1.80
Exp.Grp.III	133	42.66	6.18	.536			

The mean score was 23.50 for the Control Group, 36.48 for Experimental Group I, 41.29 for Experimental Group II, and 42.66 for Experimental Group III.

A comparison of the mean scores shows all experimental groups have significant differences at the .01 level of confidence over the Control Group. An analysis of these data shows:

The difference between the Control Group and Experimental Group I was 12.98, with a critical ratio of 13.24; the difference between

the Control Group and Experimental Group II was 17.79, with a critical ratio of 21.70; and the difference between the Control Group and Experimental Group III was 19.16, with a critical ratio of 23.65. All critical ratios in this comparison are highly significant at the .01 level of confidence, favoring the experimental groups.

The comparisons within the experimental groups show:

There was a difference of 4.81 between Experimental Groups I and II. The critical ratio of 5.12 indicates a significant difference at the .01 level of confidence, favoring Experimental Group II.

There was a difference of 6.18 between Experimental Groups I and III. The critical ratio of 6.65 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

There was a difference of 1.37 between Experimental Groups II and III. The critical ratio of 1.80 favors Experimental Group III but is not significant and merely approaches statistical significance at the .05 level of confidence.

A comparison of the mean scores of the experimental groups indicates that the greatest gains were made by Experimental Group III, followed by Experimental Groups II and I, respectively.

At the conclusion of the experimental teaching program in map skills, the children in the three experimental groups commenced the prescribed fourth grade Course of Study in social studies. The Control Group had followed this program throughout the twenty-seven-day period during which the experimental groups had worked exclusively on the map

skills lessons. Therefore, the Control Group had twenty-seven more days of instruction in social studies factual material, while the three experimental groups used this time for the special purpose of the intensive map skills lessons.

A delayed testing program was planned to measure retention and growth at the close of the school year in June. The Map Reading section of the Iowa Tests of Basic Skills (Form 2) and the Map Skills Test were readministered. A Social Studies Fact Test was constructed to be used for all groups at the testing period in June.

Table 13 shows the distribution of scores on the Map Reading section of the Iowa Tests of Basic Skills (Form 2) at the delayed testing in June.

TABLE 13

DISTRIBUTION OF SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS (FORM 2) AT THE DELAYED TESTING IN JUNE

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
66 - 68				1
63 - 65				3
60 - 62		1	1	5
57 - 59		2		2
54 - 56			3	3
51 - 53	1	1	1	5
48 - 50	1	2	1	8
45 - 47	2	3	6	8
42 - 44	2	5	5	9
39 - 41	6	10	10	9
36 - 38	6	15	14	14
33 - 35	11	15	17	6
30 - 32	16	16	25	19
27 - 29	30	17	19	14
24 - 26	25	18	21	9
21 - 23	25	13	14	4
18 - 20	18	10	4	8
15 - 17	10	6	5	5
12 - 14		3		
9 - 11	1			
N	154	137	146	133
Mean	26.87	30.49	31.58	36.64
S.D.	7.26	9.33	8.55	12.45

At the delayed testing in June, the scores for the Control Group on the Map Reading section of the Iowa Tests of Basic Skills ranged from 9 to 53, with a mean of 26.87 and a standard deviation of 7.26; Experimental Group I, from 12 to 62, with a mean of 30.49 and a standard deviation of 9.33; Experimental Group II, from 15 to 62 items correct, with a mean of 31.58 and a standard deviation of 8.55; and Experimental Group III, from 12 to 68 items correct, with a mean of

36.64 and a standard deviation of 12.45.

Table 14 presents a comparison of the mean scores on the Map Reading section of the Iowa Tests of Basic Skills at the delayed testing in June for the four groups.

TABLE 14

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS (FORM 2) AT THE DELAYED TESTING IN JUNE

Group	No.	Mean	S.D.	S.E.$_m$	Diff.$_m$	S.E.$_d$	C.R.
Control	154	26.87	7.26	.585	3.62	.99	3.66
Exp.Grp.I	137	30.49	9.33	.797			
Control	154	26.87	7.26	.585	4.71	.92	5.12
Exp.Grp.II	146	31.58	8.55	.708			
Control	154	26.87	7.26	.585	9.77	1.23	7.94
Exp.Grp.III	133	36.64	12.45	1.08			
Exp.Grp.I	137	30.49	9.33	.797	1.09	1.07	1.02
Exp.Grp.II	146	31.58	8.55	.708			
Exp.Grp.I	137	30.49	9.33	.797	6.15	1.34	4.59
Exp.Grp.III	133	36.64	12.45	1.08			
Exp.Grp.II	146	31.58	8.55	.708	5.06	1.29	3.92
Exp.Grp.III	133	36.64	12.45	1.08			

The mean score was 26.87 for the Control Group, 30.49 for Experimental Group I, 31.58 for Experimental Group II, and 36.64 for Experimental Group III.

A comparison of the mean scores shows all experimental groups have significant differences at the .01 level of confidence over the Control Group. An analysis of these data shows:

The difference between the Control Group and Experimental Group I was 3.62, with a critical ratio of 3.66; the difference between the Control Group and Experimental Group II was 4.71, with a critical ratio of 5.12; and the difference between the Control Group and Experimental Group III was 9.77, with a critical ratio of 7.94. All critical ratios in this comparison are significant at the .01 level of confidence, favoring the experimental groups.

The comparisons within the experimental groups show:

There was a difference of 1.09 between Experimental Groups I and II. The critical ratio of 1.02 favors Experimental Group II, but is not significant.

There was a difference of 6.15 between Experimental Groups I and III. The critical ratio of 4.59 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

There was a difference of 5.06 between Experimental Groups II and III. The critical ratio of 3.92 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

A comparison of the mean scores of the experimental groups indicates that the greatest gains were made by Experimental Group III, followed by Experimental Groups II and I, respectively.

Table 15 shows the distribution of scores on the Map Skills Test at the delayed testing in June.

TABLE 15

DISTRIBUTION OF SCORES ON THE MAP SKILLS TEST AT THE DELAYED TESTING IN JUNE

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
51 - 53		13	6	25
48 - 50	5	14	15	14
45 - 47	6	12	23	26
42 - 44	12	12	19	13
39 - 41	15	16	27	20
36 - 38	12	19	17	14
33 - 35	16	15	11	12
30 - 32	19	5	10	1
27 - 29	21	11	8	4
24 - 26	21	5	4	1
21 - 23	10	8	5	2
18 - 20	11	2	1	
15 - 17	2	4		1
12 - 14	3	1		
9 - 11	1			
N	154	137	146	133
Mean	31.42	36.79	39.51	42.82
S.D.	8.70	9.42	7.65	7.47

At the delayed testing in June the scores for the Control Group on the Map Skills Test ranged from 9 to 50, with a mean of 31.42 and a standard deviation of 8.70; Experimental Group I, from 12 to 53, with a mean of 36.79 and a standard deviation of 9.42; Experimental Group II, from 18 to 53, with a mean of 39.51 and a standard deviation of 7.65; Experimental Group III, from 15 to 53, with a mean of 42.82 and a standard deviation of 7.47.

Table 16 presents a comparison of the scores on the Map Skills Test at the delayed testing in June for the four groups.

TABLE 16

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE DELAYED TESTING IN JUNE

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	31.42	8.70	.701	5.37	1.07	5.02
Exp.Grp.I	137	36.79	9.42	.804			
Control	154	31.42	8.70	.701	8.09	.94	8.61
Exp.Grp.II	146	39.51	7.65	.633			
Control	154	31.42	8.70	.701	11.40	.95	12.00
Exp.Grp.III	133	42.82	7.47	.648			
Exp.Grp.I	137	36.79	9.42	.804	2.72	1.02	2.67
Exp.Grp.II	146	39.51	7.65	.633			
Exp.Grp.I	137	36.79	9.42	.804	6.03	1.03	5.85
Exp.Grp.III	133	42.82	7.47	.648			
Exp.Grp.II	146	39.51	7.65	.633	3.31	.91	3.64
Exp.Grp.III	133	42.82	7.47	.648			

The mean score was 31.42 for the Control Group, 36.79 for Experimental Group I, 39.51 for Experimental Group II, and 42.82 for Experimental Group III.

A comparison of the mean scores shows all experimental groups have significant differences at the .01 level of confidence over the Control Group. An analysis of these data shows:

The difference between the Control Group and Experimental Group I was 5.37, with a critical ratio of 5.02; the difference between the Control Group and Experimental Group II was 8.09, with a critical ratio of 8.61; and the difference between the Control Group and Experimental Group III was 11.40, with a critical ratio of 12.00. All critical

ratios in this comparison are highly significant at the .01 level of confidence, favoring the experimental groups.

The comparisons within the experimental groups show:

There was a difference of 2.72 between Experimental Groups I and II. The critical ratio of 2.67 indicates a significant difference at the .01 level of confidence, favoring Experimental Group II.

There was a difference of 6.03 between Experimental Groups I and III. The critical ratio of 5.85 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

There was a difference of 3.31 between Experimental Groups II and III. The critical ratio of 3.64 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

A comparison of the mean scores of the experimental groups indicates that the greatest gains were made by Experimental Group III, followed by Experimental Groups II and I, respectively.

Table 17 shows the distribution of scores on the Social Studies Fact Test at the delayed testing in June.

TABLE 17

DISTRIBUTION OF SCORES ON THE SOCIAL STUDIES FACT TEST AT THE DELAYED TESTING IN JUNE

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
140 - 149	2	1	4	4
130 - 139	10	4	13	20
120 - 129	14	11	20	20
110 - 119	7	17	34	22
100 - 109	13	13	23	19
90 - 99	16	18	24	22
80 - 89	28	18	7	15
70 - 79	20	17	9	9
60 - 69	20	14	6	1
50 - 59	10	11	3	
40 - 49	8	10	3	1
30 - 39	5	2		
20 - 29	1	1		
N	154	137	146	133
Mean	86.32	86.76	104.98	108.18
S.D.	27.30	26.30	22.00	20.20

In the Control Group and Experimental Group I, the scores on the Social Studies Fact Test ranged from 20 to 149, with means of 86.32 and 86.76 and standard deviations of 27.30 and 26.30, respectively, at the delayed testing in June.

In Experimental Groups II and III, the scores on the Social Studies Fact Test ranged from 40 to 149, with means of 104.98 and 108.18 and standard deviations of 22.00 and 20.20, respectively, at the delayed testing in June.

Table 18 shows a comparison of the mean scores on the Social Studies Fact Test for the four groups at the delayed testing in June.

TABLE 18

COMPARISON OF SCORES ON THE SOCIAL STUDIES FACT TEST AT THE DELAYED TESTING IN JUNE

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	86.32	27.30	2.20	.44	3.15	.14
Exp.Grp.I	137	86.76	26.30	2.25			
Control	154	86.32	27.30	2.20	18.66	2.86	6.52
Exp.Grp.II	146	104.98	22.00	1.82			
Control	154	86.32	27.30	2.20	21.86	2.81	7.78
Exp.Grp.III	133	108.18	20.20	1.75			
Exp.Grp.I	137	86.76	26.30	2.25	18.22	2.89	6.30
Exp.Grp.II	146	104.98	22.00	1.82			
Exp.Grp.I	137	86.76	26.30	2.25	21.42	2.85	7.52
Exp.Grp.III	133	108.18	20.20	1.75			
Exp.Grp.II	146	104.98	22.00	1.82	3.20	2.52	1.27
Exp.Grp.III	133	108.18	20.20	1.75			

The mean score was 86.32 for the Control Group, 86.76 for Experimental Group I, 104.98 for Experimental Group II, and 108.18 for Experimental Group III.

A comparison of mean scores shows Experimental Groups II and III have statistically significant differences at the .01 level of confidence over the Control Group and Experimental Group I. An analysis of these data shows:

There was a difference of .44 between the Control Group and Experimental Group I. The critical ratio of .14 is not significant and indicates no difference between the two groups.

The difference between the Control Group and Experimental Group

II was 18.66, with a critical ratio of 6.52, and the difference between the Control Group and Experimental Group III was 21.86, with a critical ratio of 7.78. These critical ratios are highly significant at the .01 level of confidence, favoring the experimental groups.

The comparisons within the experimental groups show:

There was a difference of 18.22 between Experimental Groups I and II. The critical ratio of 6.30 indicates a significant difference at the .01 level of confidence, favoring Experimental Group II.

There was a difference of 21.42 between Experimental Groups I and III. The critical ratio of 7.52 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

There was a difference of 3.20 between Experimental Groups II and III. The critical ratio of 1.27 indicates no significant difference between the groups.

A comparison of mean scores shows the greatest gains were made by Experimental Group III, followed by Experimental Group II, Experimental Group I, and the Control Group, respectively.

A second delayed testing program was planned to measure retention after the summer vacation. In September the following tests were re-administered to the four groups: (a) the Map Reading section of the Iowa Tests of Basic Skills (Form 1); (b) the Map Skills Test; and (c) the Social Studies Fact Test.

Due to illness, summer transfers, and summer drop-outs, the data for the September retention test were analyzed for 521 children.

The Control Group lost ten children, reducing the number to 144; Experimental Group I lost 13 children, reducing the number to 124; Experimental Group II lost 14 children, reducing the number to 132; and Experimental Group III lost 12 children, reducing the number to 121.

A comparison was made to determine if the groups remained equated even though there had been a reduction of the total population after the summer vacation. The data of the total population at the initial testing and the population which remained at the delayed testing in September were used to compare the mean chronological ages and mental ages, and the mean scores on the Map Reading section of the Iowa Tests of Basic Skills and the Map Skills Test.

The following legend has been used in Tables 19 through 34:

I.T. = Initial Testing
D.T. = Delayed Testing

Tables 19 through 22 show a comparison of mean chronological ages for the total population of each group at the initial testing and the population which remained in the study at the delayed testing in September.

TABLE 19

COMPARISON OF MEAN CHRONOLOGICAL AGES
OF THE TOTAL CONTROL GROUP POPULATION OF 154 AT THE INITIAL TESTING
AND THE 144 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	154	111.34	8.40	.677	.12	.98	.12
D.T.	Control	144	111.46	8.52	.710			

TABLE 20

COMPARISON OF MEAN CHRONOLOGICAL AGES OF THE TOTAL EXPERIMENTAL GROUP I POPULATION OF 137 AT THE INITIAL TESTING AND THE 124 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	137	111.34	8.04	.687	.02	1.00	.02
D.T.	Exp.Grp.I	124	111.32	8.07	.724			

TABLE 21

COMPARISON OF MEAN CHRONOLOGICAL AGES OF THE TOTAL EXPERIMENTAL GROUP II POPULATION OF 146 AT THE INITIAL TESTING AND THE 132 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	146	111.37	8.94	.740	.53	1.06	.50
D.T.	Exp.Grp.II	132	110.84	8.76	.760			

TABLE 22

COMPARISON OF MEAN CHRONOLOGICAL AGES OF THE TOTAL EXPERIMENTAL GROUP III POPULATION OF 133 AT THE INITIAL TESTING AND THE 121 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	133	111.37	8.52	.739	.66	1.03	.64
D.T.	Exp.Grp.III	121	110.71	7.95	.723			

There was no significant difference between any of the groups. This would indicate that the groups remained equated on this measure.

Tables 23 through 26 show a comparison of mean mental ages for the total population of each group at the initial testing and the population which remained in the study at the delayed testing in September.

TABLE 23

COMPARISON OF MEAN MENTAL AGES OF THE TOTAL CONTROL GROUP POPULATION OF 154 AT THE INITIAL TESTING AND THE 144 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	154	118.55	7.47	.602	.07	.86	.08
D.T.	Control	144	118.62	7.35	.613			

TABLE 24

COMPARISON OF MEAN MENTAL AGES OF THE TOTAL EXPERIMENTAL GROUP I POPULATION OF 137 AT THE INITIAL TESTING AND THE 124 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	137	118.50	7.68	.656	.20	.94	.21
D.T.	Exp.Grp.I	124	118.70	7.47	.671			

TABLE 25

COMPARISON OF MEAN MENTAL AGES OF THE TOTAL EXPERIMENTAL GROUP II POPULATION OF 146 AT THE INITIAL TESTING AND THE 132 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	146	118.37	7.98	.661	.20	.95	.21
D.T.	Exp.Grp.II	132	118.57	7.92	.688			

TABLE 26

COMPARISON OF MEAN MENTAL AGES OF THE TOTAL EXPERIMENTAL GROUP III POPULATION OF 133 AT THE INITIAL TESTING AND THE 121 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	133	118.36	8.37	.726	.26	1.05	.25
D.T.	Exp.Grp.III	121	118.62	8.40	.764			

There was no significant difference between any of the groups. This would indicate that the groups remained equated on this measure.

Tables 27 through 30 show a comparison of mean scores on the Map Reading section of the Iowa Tests of Basic Skills for the total population of each group at the initial testing and the population which remained in the study at the delayed testing in September.

TABLE 27

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS OF THE TOTAL CONTROL GROUP POPULATION OF 154 AT THE INITIAL TESTING AND THE 144 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	154	21.59	6.93	.557	.13	.80	.16
D.T.	Control	144	21.46	6.93	.578			

TABLE 28

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS OF THE TOTAL EXPERIMENTAL GROUP I POPULATION OF 137 AT THE INITIAL TESTING AND THE 124 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	S.E.m	Diff.m	S.E.d	C.R.
I.T.	Exp.Grp.I	137	21.43	8.49	.725	.06	1.06	.06
D.T.	Exp.Grp.I	124	21.49	8.61	.773			

TABLE 29

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS OF THE TOTAL EXPERIMENTAL GROUP II POPULATION OF 146 AT THE INITIAL TESTING AND THE 132 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	S.E.m	Diff.m	S.E.d	C.R.
I.T.	Exp.Grp.II	146	21.33	8.46	.700	.38	1.00	.38
D.T.	Exp.Grp.II	132	21.71	8.31	.721			

TABLE 30

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS OF THE TOTAL EXPERIMENTAL GROUP III POPULATION OF 133 AT THE INITIAL TESTING AND THE 121 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	S.E.m	Diff.m	S.E.d	C.R.
I.T.	Exp.Grp.III	133	21.21	8.40	.729	.64	1.05	.61
D.T.	Exp.Grp.III	121	21.85	8.37	.761			

There was no significant difference between any of the groups. This would indicate that the groups remained equated on this measure.

Tables 31 through 34 show a comparison of mean scores on the Map Skills Test for the total population of each group at the initial testing and the population which remained in the study at the delayed testing in September.

TABLE 31

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST OF THE TOTAL CONTROL GROUP POPULATION OF 154 AT THE INITIAL TESTING AND THE 144 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	154	21.55	6.87	.554	.05	.78	.06
D.T.	Control	144	21.50	6.57	.548			

TABLE 32

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST OF THE TOTAL EXPERIMENTAL GROUP I POPULATION OF 137 AT THE INITIAL TESTING AND THE 124 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	137	21.41	8.85	.756	.04	1.11	.04
D.T.	Exp.Grp.I	124	21.37	9.09	.816			

TABLE 33

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST OF THE TOTAL EXPERIMENTAL GROUP II POPULATION OF 146 AT THE INITIAL TESTING AND THE 132 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	146	21.39	7.23	.599	.03	.86	.03
D.T.	Exp.Grp.II	132	21.36	7.14	.619			

TABLE 34

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST OF THE TOTAL EXPERIMENTAL GROUP III POPULATION OF 133 AT THE INITIAL TESTING AND THE 121 WHO REMAINED IN THE DELAYED TESTING IN SEPTEMBER

	Group	No.	Mean	S.D.	S.E.$_m$	Diff.$_m$	S.E.$_d$	C.R.
I.T.	Exp.Grp.III	133	21.39	7.26	.629	.29	.92	.31
D.T.	Exp.Grp.III	121	21.68	7.41	.674			

There was no significant difference between any of the groups. This would indicate that the groups remained equated on this measure.

Since all equating measures remained comparable, the data for the delayed testing in September were based on those who remained in the study after the summer vacation.

Table 35 shows the distribution of scores on the Map Reading section of the Iowa Tests of Basic Skills (Form 1) at the delayed testing in September.

TABLE 35

DISTRIBUTION OF SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS (FORM 1) AT THE DELAYED TESTING IN SEPTEMBER

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
69 - 71			1	
66 - 68				1
63 - 65				2
60 - 62				3
57 - 59				3
54 - 56	2	2	3	1
51 - 53	2	2	1	5
48 - 50	1	4	1	6
45 - 47	6	3	5	11
42 - 44	5	4	9	6
39 - 41	8	6	12	9
36 - 38	9	14	17	11
33 - 35	8	20	21	12
30 - 32	20	17	12	15
27 - 29	27	11	18	15
24 - 26	24	17	18	6
21 - 23	9	13	5	8
18 - 20	8	4	6	5
15 - 17	8	3	2	2
12 - 14	4	2	1	
9 - 11	2			
6 - 8	1	2		
N	144	124	132	121
Mean	29.25	31.20	33.11	36.68
S.D.	9.33	9.24	8.91	11.46

In the Control Group and Experimental Group I, the scores on the Map Reading section of the Iowa Tests of Basic Skills ranged from 6 to 56, with means of 29.25 and 31.20 and standard deviations of 9.33 and 9.24, respectively, at the delayed testing in September.

In Experimental Group II, the scores ranged from 12 to 71, with

a mean of 33.11 and a standard deviation of 8.91, and in Experimental Group III, from 15 to 68, with a mean of 36.68 and a standard deviation of 11.46.

Table 36 presents a comparison of the mean scores on the Map Reading section of the Iowa Tests of Basic Skills at the delayed testing in September for the four groups.

TABLE 36

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS (FORM 1) AT THE DELAYED TESTING IN SEPTEMBER

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	144	29.25	9.33	.778	1.95	1.14	1.71
Exp.Grp.I	124	31.20	9.24	.829			
Control	144	29.25	9.33	.778	3.86	1.10	3.51
Exp.Grp.II	132	33.11	8.91	.775			
Control	144	29.25	9.33	.778	7.43	1.30	5.71
Exp.Grp.III	121	36.68	11.46	1.04			
Exp.Grp.I	124	31.20	9.24	.829	1.91	1.13	1.69
Exp.Grp.II	132	33.11	8.91	.775			
Exp.Grp.I	124	31.20	9.24	.829	5.48	1.33	4.12
Exp.Grp.III	121	36.68	11.46	1.04			
Exp.Grp.II	132	33.11	8.91	.775	3.57	1.30	2.75
Exp.Grp.III	121	36.68	11.46	1.04			

The mean score was 29.25 for the Control Group, 31.20 for Experimental Group I, 33.11 for Experimental Group II, and 36.68 for Experimental Group III.

A comparison of the mean scores shows Experimental Groups II and III have statistically significant differences at the .01 level of

confidence over the Control Group and Experimental Group I. An analysis of these data shows:

There was a difference of 1.95 between the Control Group and Experimental Group I. The critical ratio of 1.71 approaches significance at the .05 level of confidence but indicates no statistical difference between the two groups.

The difference between the Control Group and Experimental Group II was 3.86, with a critical ratio of 3.51 and the difference between the Control Group and Experimental Group III was 7.43, with a critical ratio of 5.71. These critical ratios are significant at the .01 level of confidence, favoring the experimental groups.

The comparisons within the experimental groups show:

There was a difference of 1.91 between Experimental Groups I and II. The critical ratio of 1.69 indicates no significant difference between the groups.

There was a difference of 5.48 between Experimental Groups I and III. The critical ratio of 4.12 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

There was a difference of 3.57 between Experimental Groups II and III. The critical ratio of 2.75 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

A comparison of the mean scores of the experimental groups indicates that the greatest gains were made by Experimental Group III, followed by Experimental Groups II and I, respectively.

Table 37 shows the distribution of scores on the Map Skills Test at the delayed testing in September.

TABLE 37

DISTRIBUTION OF SCORES ON THE MAP SKILLS TEST AT THE DELAYED TESTING IN SEPTEMBER

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
51 - 53		6	5	14
48 - 50	6	9	17	21
45 - 47	5	15	22	24
42 - 44	17	16	13	17
39 - 41	14	17	19	9
36 - 38	13	6	19	8
33 - 35	25	11	10	14
30 - 32	20	13	17	3
27 - 29	13	10	2	8
24 - 26	9	4	1	1
21 - 23	11	2	2	2
18 - 20	4	7	3	
15 - 17	3	4	1	
12 - 14	4	3	1	
9 - 11		1		
N	144	124	132	121
Mean	33.15	36.13	39.43	42.33
S.D.	8.55	10.38	8.10	7.53

At the delayed testing in September the scores on the Map Skills Test for the Control Group ranged from 21 to 50, with a mean of 33.15 and a standard deviation of 8.55; Experimental Group I, from 9 to 53, with a mean of 36.13 and a standard deviation of 10.38; Experimental Group II, from 12 to 53, with a mean of 39.43 and a standard deviation of 8.10; and Experimental Group III, from 21 to 53, with a mean of 42.33 and a standard deviation of 7.53.

Table 38 presents a comparison of the scores on the Map Skills Test at the delayed testing in September.

TABLE 38

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE DELAYED TESTING IN SEPTEMBER

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	144	33.15	8.55	.713	2.98	1.17	2.55
Exp.Grp.I	124	36.13	10.38	.932			
Control	144	33.15	8.55	.713	6.28	1.00	6.28
Exp.Grp.II	132	39.43	8.10	.705			
Control	144	33.15	8.55	.713	9.18	.99	9.27
Exp.Grp.III	121	42.33	7.53	.685			
Exp.Grp.I	124	36.13	10.38	.932	3.30	1.17	2.82
Exp.Grp.II	132	39.43	8.10	.705			
Exp.Grp.I	124	36.13	10.38	.932	6.20	1.16	5.34
Exp.Grp.III	121	42.33	7.53	.685			
Exp.Grp.II	132	39.43	8.10	.705	2.90	.98	2.96
Exp.Grp.III	121	42.33	7.53	.685			

The mean score is 33.15 for the Control Group, 36.13 for Experimental Group I, 39.43 for Experimental Group II, and 42.33 for Experimental Group III.

A comparison of mean scores shows all experimental groups have statistically significant differences over the Control Group. An analysis of these data shows:

There was a difference of 2.98 between the Control Group and Experimental Group I. The critical ratio of 2.55 indicates a significant difference at the .05 level of confidence and approaches *signifi-*

cance at the .01 level of confidence.

The difference between the Control Group and Experimental Group II was 6.28, with a critical ratio of 6.28 and the difference between the Control Group and Experimental Group III was 9.18, with a critical ratio of 9.27. These critical ratios are highly significant at the .01 level of confidence, favoring the experimental groups.

The comparisons within the experimental groups show:

There was a difference of 3.30 between Experimental Groups I and II. The critical ratio of 2.82 indicates a significant difference at the .01 level of confidence, favoring Experimental Group II.

There was a difference of 6.20 between Experimental Groups I and III. The critical ratio of 5.34 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

There was a difference of 2.90 between Experimental Groups II and III. The critical ratio of 2.96 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

A comparison of the mean scores of the experimental groups indicates that the greatest gains were made by Experimental Group III, followed by Experimental Groups II and I, respectively.

Table 39 shows the distribution of scores on the Social Studies Fact Test at the delayed testing in September.

TABLE 39

DISTRIBUTION OF SCORES ON THE SOCIAL STUDIES FACT TEST AT THE DELAYED TESTING IN SEPTEMBER

Scores	Frequency			
	Control Group	Experimental Group I	Experimental Group II	Experimental Group III
140 - 149			2	4
130 - 139	7	6	9	14
120 - 129	8	8	11	18
110 - 119	14	9	24	14
100 - 109	23	11	22	14
90 - 99	17	18	19	18
80 - 89	23	22	13	11
70 - 79	16	17	19	13
60 - 69	14	17	5	11
50 - 59	12	6	2	3
40 - 49	7	5	4	1
30 - 39	2	5	2	
20 - 29	1			
N	144	124	132	121
Mean	87.83	85.71	97.76	101.52
S.D.	25.00	24.80	23.60	24.60

At the delayed testing in September the scores on the Social Studies Fact Test for the Control Group ranged from 20 to 139, with a mean of 87.83 and a standard deviation of 25.00; Experimental Group I, from 30 to 139, with a mean of 85.71 and a standard deviation of 24.80; Experimental Group II, from 30 to 149, with a mean of 97.76 and a standard deviation of 23.60; and Experimental Group III, from 40 to 149, with a mean of 101.52 and a standard deviation of 24.60.

Table 40 presents a comparison of the mean scores on the Social Studies Fact Test for the four groups at the delayed testing in September.

TABLE 40

COMPARISON OF MEAN SCORES ON THE SOCIAL STUDIES FACT TEST AT THE DELAYED TESTING IN SEPTEMBER

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	144	87.83	25.00	2.08	2.12	3.05	.69
Exp.Grp.I	124	85.71	24.80	2.23			
Control	144	87.83	25.00	2.08	9.93	2.92	3.40
Exp.Grp.II	132	97.76	23.60	2.05			
Control	144	87.83	25.00	2.08	13.69	3.06	4.47
Exp.Grp.III	121	101.52	24.60	2.24			
Exp.Grp.I	124	85.71	24.80	2.23	12.05	3.03	3.98
Exp.Grp.II	132	97.76	23.60	2.05			
Exp.Grp.I	124	85.71	24.80	2.23	15.81	3.15	5.02
Exp.Grp.III	121	101.52	24.60	2.24			
Exp.Grp.II	132	97.76	23.60	2.05	3.76	3.04	1.24
Exp.Grp.III	121	101.52	24.60	2.24			

The mean score was 87.83 for the Control Group; 85.71 for Experimental Group I, 97.76 for Experimental Group II, and 101.52 for Experimental Group III.

A comparison of the mean scores shows Experimental Groups II and III have statistically significant differences at the .01 level of confidence over the Control Group and Experimental Group I. An analysis of these data shows:

There was a difference of 2.12 between the Control Group and Experimental Group I. The critical ratio of .69 favors the Control Group but is not significant and indicates no difference between the groups.

The difference between the Control Group and Experimental Group II was 9.93, with a critical ratio of 3.40, and the difference between the Control Group and Experimental Group III was 13.69, with a critical ratio of 4.47. These critical ratios are significant at the .01 level of confidence, favoring the experimental groups.

The comparisons within the experimental groups show:

There was a difference of 12.05 between Experimental Groups I and II. The critical ratio of 3.98 indicates a significant difference at the .01 level of confidence, favoring Experimental Group II.

There was a difference of 15.81 between Experimental Groups I and III. The critical ratio of 5.02 indicates a significant difference at the .01 level of confidence, favoring Experimental Group III.

There was a difference of 3.76 between Experimental Groups II and III. The critical ratio of 1.24 indicates no significant difference between the groups.

A comparison of mean scores indicates the greatest gains were made by Experimental Group III, followed by Experimental Group II, the Control Group, and Experimental Group I, respectively.

Tables 41 through 44 show a comparison of mean scores for each group on the Map Reading section of the Iowa Tests of Basic Skills (Form 1 and Form 2) at the initial testing and at the close of the experimental teaching period.

TABLE 41

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	21.59	6.93	.557	.17	.78	.22
Control	154	21.42	6.75	.544			

TABLE 42

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	21.43	8.49	.725	6.22	1.01	6.16
Exp.Grp.I	137	27.65	9.30	.709			

TABLE 43

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	21.33	8.46	.700	11.13	.91	12.23
Exp.Grp.II	146	32.46	6.99	.579			

TABLE 44

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	21.21	8.40	.729	14.92	1.19	12.54
Exp.Grp.III	133	36.13	10.83	.939			

In the Control Group, from the initial testing to the close of the experimental teaching period, there was a loss of .17, which resulted in a critical ratio of .22. This showed no statistical significance.

The experimental groups made gains which were all highly significant at the .01 level of confidence. In Experimental Group I, the difference of 6.22 resulted in a critical ratio of 6.16; in Experimental Group II, the difference of 11.13 resulted in a critical ratio of 12.23; and in Experimental Group III, the difference of 14.92 resulted in a critical ratio of 12.54.

The critical ratios became progressively larger, favoring Experimental Groups III, II, and I, respectively.

Tables 45 through 48 show a comparison of mean scores for each group on the Map Reading section of the Iowa Tests of Basic Skills (Form 1 and Form 2) at the initial testing and at the delayed testing in June.

TABLE 45

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	21.59	6.93	.557	5.28	.81	6.52
Control	154	26.87	7.26	.585			

TABLE 46

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	21.43	8.49	.725	9.06	1.08	8.39
Exp.Grp.I	137	30.49	9.33	.797			

TABLE 47

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	21.33	8.46	.700	10.25	1.00	10.25
Exp.Grp.II	146	31.58	8.55	.708			

TABLE 48

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	21.21	8.40	.729	15.43	1.30	11.87
Exp.Grp.III	133	36.64	12.45	1.08			

All groups showed statistically significant differences at the .01 level of confidence from the initial testing to the delayed testing in June. In the Control Group the difference between means was 5.28, resulting in a critical ratio of 6.52; in Experimental Group I, the difference was 9.06, resulting in a critical ratio of 8.39; in Experimental Group II, the difference was 10.25, resulting in a critical ratio of 10.25; and in Experimental Group III, the difference was 15.43, resulting in a critical ratio of 11.87.

The critical ratios became progressively higher, favoring Experimental Groups III, II, and I, and the Control Group, respectively.

Tables 49 through 52 show a comparison of mean scores for each group on the Map Reading section of the Iowa Tests of Basic Skills (Form 1 and Form 2) at the initial testing and at the delayed testing in September.

TABLE 49

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN SEPTEMBER--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	21.59	6.93	.557	7.66	.96	7.98
Control	144	29.25	9.33	.778			

TABLE 50

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	21.43	8.49	.725	9.77	1.10	8.88
Exp.Grp.I	124	31.20	9.24	.829			

TABLE 51

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	21.33	8.46	.700	11.78	1.04	11.33
Exp.Grp.II	132	33.11	8.91	.775			

TABLE 52

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	21.21	8.40	.729	15.47	1.27	12.18
Exp.Grp.III	121	36.68	11.46	1.04			

All groups showed statistically significant differences at the .01 level of confidence from the initial testing to the delayed testing in September. In the Control Group, the difference between means was 7.66, resulting in a critical ratio of 7.98; in Experimental Group I, the difference was 9.77, resulting in a critical ratio of 8.88; in Experimental Group II, the difference was 11.78, resulting in a critical ratio of 11.33; and in Experimental Group III, the difference was 15.47, resulting in a critical ratio of 12.18.

The critical ratios became progressively higher, favoring Experimental Groups III, II, and I, and the Control Group, respectively.

Tables 53 through 56 show a comparison of mean scores for each group on the Map Reading section of the Iowa Tests of Basic Skills at the close of the experimental teaching period and at the delayed testing in June.

TABLE 53

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN JUNE--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	21.42	6.75	.544	5.45	.80	6.81
Control	154	26.87	7.26	.585			

TABLE 54

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN JUNE--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	27.65	9.30	.709	2.84	1.07	2.67
Exp.Grp.I	137	30.49	9.33	.797			

TABLE 55

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN JUNE--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	32.46	6.99	.579	.88	.91	.97
Exp.Grp.II	146	31.58	8.55	.708			

TABLE 56

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE CLOSE OF EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN JUNE--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	36.13	10.83	.939	.51	1.43	.36
Exp.Grp.III	133	36.64	12.45	1.08			

In the Control Group and Experimental Group I, from the close of the experimental teaching period to the delayed testing in June, there were gains which were statistically significant at the .01 level of confidence. In the Control Group, the difference of 5.45 resulted in a critical ratio of 6.81, and in Experimental Group I the difference of 2.84 resulted in a critical ratio of 2.67.

In Experimental Group II, there was a loss of .88, which resulted in a critical ratio of .97. In Experimental Group III, a gain of .51 resulted in a critical ratio of .36. This indicates that there was no statistically significant difference for Experimental Groups II and III from the close of the experimental teaching period to the delayed testing in June.

Tables 57 through 60 show a comparison of mean scores for each group on the Map Reading section of the Iowa Tests of Basic Skills at the close of the experimental teaching period and at the delayed testing in September.

TABLE 57

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN SEPTEMBER--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	21.42	6.75	.544	7.83	.95	8.24
Control	144	29.25	9.33	.778			

TABLE 58

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	27.65	9.30	.709	3.55	1.09	3.26
Exp.Grp.I	124	31.20	9.24	.829			

TABLE 59

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	32.46	6.99	.579	.65	.97	.67
Exp.Grp.II	132	33.11	8.91	.775			

TABLE 60

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	36.13	10.83	.939	.55	1.40	.39
Exp.Grp.III	121	36.68	11.46	1.04			

In the Control Group and Experimental Group I, from the close of the experimental teaching period to the delayed testing in September, there were gains which were statistically significant at the .01 level of confidence. In the Control Group, the difference of 7.83 resulted in a critical ratio of 8.24, and in Experimental Group I the difference of 3.55 resulted in a critical ratio of 3.26.

In Experimental Group II, there was a gain of .65, which resulted in a critical ratio of .67. In Experimental Group III, a gain of .55 resulted in a critical ratio of .39. This indicates that there was no statistically significant difference for Experimental Groups II and III from the close of the experimental teaching period to the delayed testing in September.

Tables 61 through 64 show a comparison of mean scores for each group on the Map Reading section of the Iowa Tests of Basic Skills at the delayed testing in June and at the delayed testing in September.

TABLE 61

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE DELAYED TESTING IN JUNE AND AT THE DELAYED TESTING IN SEPTEMBER--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	26.87	7.26	.585	2.38	.97	2.45
Control	144	29.25	9.33	.778			

TABLE 62

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE DELAYED TESTING IN JUNE AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	30.49	9.33	.797	.71	1.15	.62
Exp.Grp.I	124	31.20	9.24	.829			

TABLE 63

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE DELAYED TESTING IN JUNE AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	31.58	8.55	.708	1.53	1.05	1.46
Exp.Grp.II	132	33.11	8.91	.775			

TABLE 64

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE DELAYED TESTING IN JUNE AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	36.64	12.45	1.08	.04	1.50	.03
Exp.Grp.III	121	36.68	11.46	1.04			

From the delayed testing in June to the delayed testing in September, there was no statistically significant difference at the .01 level of confidence in all groups; however, in the Control Group the difference of 2.38 resulted in a critical ratio of 2.45, which was significant at the .05 level of confidence. In Experimental Group I, the difference of .71 resulted in a critical ratio of .62; in Experimental Group II, the difference of 1.53 resulted in a critical ratio of 1.46; and in Experimental Group III, the difference of .04 resulted in a critical ratio of .03.

Tables 65 through 68 show a comparison of mean scores for each group on the Map Skills Test at the initial testing and at the close of the experimental teaching period.

TABLE 65

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	21.55	6.87	.554	1.95	.83	2.35
Control	154	23.50	7.59	.612			

TABLE 66

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	21.41	8.85	.756	15.07	1.07	14.08
Exp.Grp.I	137	36.48	8.94	.763			

TABLE 67

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	21.39	7.23	.599	19.90	.81	24.57
Exp.Grp.II	146	41.29	6.54	.541			

TABLE 68

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	21.39	7.26	.629	21.27	.83	25.63
Exp.Grp.III	133	42.66	6.18	.536			

In the Control Group, from the initial testing to the close of the experimental period, there was a gain of 1.95, resulting in a critical ratio of 2.35. This indicates statistical significance at the .05 level of confidence but not at the .01 level of confidence.

The experimental groups made gains which were highly significant at the .01 level of confidence. In Experimental Group I, the difference of 15.07 resulted in a critical ratio of 14.08; in Experimental Group II, the difference of 19.90 resulted in a critical ratio of 24.57; and in Experimental Group III, the difference of 21.27 resulted in a critical ratio of 25.63.

The critical ratios became progressively higher, favoring Experimental Groups III, II, and I, respectively.

Tables 69 through 72 show a comparison of mean scores for each group on the Map Skills Test at the initial testing and at the delayed testing in June.

TABLE 69

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE-- CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	21.55	6.87	.554	9.87	.89	11.09
Control	154	31.42	8.70	.701			

TABLE 70

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE-- EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	21.41	8.85	.756	15.38	1.10	13.98
Exp.Grp.I	137	36.79	9.42	.804			

TABLE 71

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE-- EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	21.39	7.23	.599	18.12	.87	20.83
Exp.Grp.II	146	39.51	7.65	.633			

TABLE 72

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE-- EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	21.39	7.26	.629	21.43	.90	23.81
Exp.Grp.III	133	42.82	7.47	.648			

All groups showed statistically significant differences at the .01 level of confidence from the initial testing to the delayed testing in June. In the Control Group, the difference between means was 9.87, resulting in a critical ratio of 11.09; in Experimental Group I, the difference was 15.38, resulting in a critical ratio of 13.98; in Experimental Group II, the difference was 18.12, resulting in a critical ratio of 20.83; and in Experimental Group III, the difference was 21.43, resulting in a critical ratio of 23.81.

The critical ratios became progressively higher, favoring Experimental Groups III, II, and I, and the Control Group, respectively.

Tables 73 through 76 show a comparison of mean scores for each group on the Map Skills Test at the initial testing and at the delayed testing in September.

TABLE 73

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN SEPTEMBER-- CONTROL GROUP

Group	No.	Mean	S.D.	S.E.m	Diff.m	S.E.d	C.R.
Control	154	21.55	6.87	.554	11.60	.90	12.89
Control	144	33.15	8.55	.713			

TABLE 74

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN SEPTEMBER-- EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	21.41	8.85	.756	14.72	1.20	12.25
Exp.Grp.I	124	36.13	10.38	.932			

TABLE 75

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN SEPTEMBER-- EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	21.39	7.23	.599	18.04	.93	19.40
Exp.Grp.II	132	39.43	8.10	.705			

TABLE 76

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN SEPTEMBER-- EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	21.39	7.26	.629	20.94	.93	22.52
Exp.Grp.III	121	42.33	7,53	.685			

All the groups showed statistically significant differences at the .01 level of confidence from the initial testing to the delayed testing in September. In the Control Group, the difference between means was 11.60, resulting in a critical ratio of 12.89; in Experimental Group I, the difference was 14.72, resulting in a critical ratio of 12.25; in Experimental Group II, the difference was 18.04, resulting in a critical ratio of 19.40; and in Experimental Group III, the difference was 20.94, resulting in a critical ratio of 22.52.

The critical ratios became progressively higher, favoring Experimental Groups III and II, the Control Group, and Experimental Group I, respectively.

Tables 77 through 80 show a comparison of mean scores for each group on the Map Skills Test at the close of the experimental teaching period and at the delayed testing in June.

TABLE 77

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN JUNE--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	23.50	7.59	.612	7.92	.93	8.52
Control	154	31.42	8.70	.701			

TABLE 78

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN JUNE--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	36.48	8.94	.763	.31	1.11	.28
Exp.Grp.I	137	36.79	9.42	.804			

TABLE 79

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD AND AT THE DELAYED TESTING IN JUNE--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	41.29	6.54	.541	1.78	.83	2.14
Exp.Grp.II	146	39.51	7.65	.633			

TABLE 80

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD
AND AT THE DELAYED TESTING IN JUNE--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	42.66	6.18	.536	.16	.84	.19
Exp.Grp.III	133	42.82	7.47	.648			

In the Control Group, from the close of the experimental teaching period to the delayed testing in June, the gain of 7.92 resulted in a critical ratio of 8.52, which was highly significant at the .01 level of confidence.

All experimental groups showed no statistically significant differences at the .01 level of confidence; however, Experimental Group II showed a loss of 1.78, which resulted in a critical ratio of 2.14. This was significant at the .05 level of confidence. In Experimental Group I, the difference of .31 resulted in a critical ratio of .28, and in Experimental Group III the difference of .16 resulted in a critical ratio of .19.

Tables 81 through 84 show a comparison of mean scores for each group on the Map Skills Test at the close of the experimental teaching period and at the delayed testing in September.

TABLE 81

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD
AND AT THE DELAYED TESTING IN SEPTEMBER--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	23.50	7.59	.612	9.65	.94	10.27
Control	144	33.15	8.55	.713			

TABLE 82

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD
AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	36.48	8.94	.763	.35	1.20	.29
Exp.Grp.I	124	36.13	10.38	.932			

TABLE 83

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD
AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	41.29	6.54	.541	1.86	.89	2.09
Exp.Grp.II	132	39.43	8.10	.705			

TABLE 84

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD
AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	42.66	6.18	.536	.33	.87	.38
Exp.Grp.III	121	42.33	7.53	.685			

In the Control Group, from the close of the experimental teaching period to the delayed testing in September, the gain of 9.65 resulted in a critical ratio of 10.27, which was highly significant at the .01 level of confidence.

All experimental groups showed no statistically significant differences at the .01 level of confidence; however, Experimental Group II showed a loss of 1.86, which resulted in a critical ratio of 2.09. This was significant at the .05 level of confidence. In Experimental Group I, the difference of .35 resulted in a critical ratio of .29, and in Experimental Group III the difference of .33 resulted in a critical ratio of .38.

Tables 85 through 88 show a comparison of mean scores for each group on the Map Skills Test at the delayed testing in June and at the delayed testing in September.

TABLE 85

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE DELAYED TESTING IN JUNE
AND AT THE DELAYED TESTING IN SEPTEMBER--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	31.42	8.70	.701	1.73	1.00	1.73
Control	144	33.15	8.55	.713			

TABLE 86

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE DELAYED TESTING IN JUNE
AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	36.79	9.42	.804	.66	1.23	.54
Exp.Grp.I	124	36.13	10.38	.932			

TABLE 87

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE DELAYED TESTING IN JUNE
AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	39.51	7.65	.633	.08	.95	.08
Exp.Grp.II	132	39.43	8.10	.705			

TABLE 88

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST
AT THE DELAYED TESTING IN JUNE
AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	42.82	7.47	.648	.49	.94	.52
Exp.Grp.III	121	42.33	7.53	.685			

From the delayed testing in June to the delayed testing in September, there was no statistically significant difference at the .01 level of confidence in all groups. In the Control Group, the difference of 1.73 resulted in a critical ratio of 1.73; in Experimental Group I, the difference of .66 resulted in a critical ratio of .54; in Experimental Group II, the difference of .08 resulted in a critical ratio of .08; and in Experimental Group III, the difference of .49 resulted in a critical ratio of .52.

Tables 89 through 92 show a comparison of mean scores for each group on the Social Studies Fact Test at the delayed testing in June and at the delayed testing in September.

TABLE 89

COMPARISON OF MEAN SCORES ON THE SOCIAL STUDIES FACT TEST AT THE DELAYED TESTING IN JUNE AND AT THE DELAYED TESTING IN SEPTEMBER--CONTROL GROUP

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Control	154	86.32	27.30	2.20	1.51	3.03	.50
Control	144	87.83	25.00	2.08			

TABLE 90

COMPARISON OF MEAN SCORES ON THE SOCIAL STUDIES FACT TEST AT THE DELAYED TESTING IN JUNE AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP I

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.I	137	86.76	26.30	2.25	1.05	3.17	.33
Exp.Grp.I	124	85.71	24.80	2.23			

TABLE 91

COMPARISON OF MEAN SCORES ON THE SOCIAL STUDIES FACT TEST AT THE DELAYED TESTING IN JUNE AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP II

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.II	146	104.98	22.00	1.82	7.22	2.74	2.64
Exp.Grp.II	132	97.76	23.60	2.05			

TABLE 92

COMPARISON OF MEAN SCORES ON THE SOCIAL STUDIES FACT TEST
AT THE DELAYED TESTING IN JUNE
AND AT THE DELAYED TESTING IN SEPTEMBER--EXPERIMENTAL GROUP III

Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
Exp.Grp.III	133	108.18	20.20	1.75	6.66	2.84	2.35
Exp.Grp.III	121	101.52	24.60	2.24			

From the delayed testing in June to the delayed testing in September, there was no significant difference in the Control Group or in Experimental Group I.

In Experimental Group II, the difference between means showed a loss of 7.22, resulting in a critical ratio of 2.64. This was statistically significant at the .01 level of confidence.

In Experimental Group III, there was a loss of 6.66, which resulted in a critical ratio of 2.35. Although significant at the .05 level of confidence, it merely approaches significance at the .01 level of confidence.

Table 93 shows a summary of the mean scores at each phase of the experiment for the four groups.

TABLE 93

SUMMARY OF MEAN SCORES

Map Reading section of the Iowa Tests of Basic Skills

	Control Group	Exp.Grp. I	Exp.Grp. II	Exp.Grp. III
Initial Testing	21.59	21.43	21.33	21.21
End of Experimental Teaching	21.42	27.65	32.46	36.13
Delayed Testing in June	26.87	30.49	31.58	36.64
Delayed Testing in September	29.25	31.20	33.11	36.68

Map Skills Test

	Control Group	Exp.Grp. I	Exp.Grp. II	Exp.Grp. III
Initial Testing	21.55	21.41	21.39	21.39
End of Experimental Teaching	23.50	36.48	41.29	42.66
Delayed Testing in June	31.42	36.79	39.51	42.82
Delayed Testing in September	33.15	36.13	39.43	42.33

Social Studies Fact Test

	Control Group	Exp.Grp. I	Exp.Grp. II	Exp.Grp. III
Delayed Testing in June	86.32	86.76	104.98	108.18
Delayed Testing in September	87.83	85.71	97.76	101.52

Table 94 shows a summary of critical ratios which were yielded at each phase of the testing on the Map Reading section of the Iowa Tests of Basic Skills for the four groups. For the purpose of this summary, the critical ratios are presented in four classifications: 1.95 and below, 1.96 to 2.57, 2.58 to 2.99, and 3.00 and higher.

The column heading designates the group which yielded the favoring critical ratio.

The following legend has been used:

I.T. = Initial Testing
E.E.T. = End of Experimental Teaching
D.T.J. = Delayed Testing in June
D.T.S. = Delayed Testing in September

TABLE 94

SUMMARY OF CRITICAL RATIOS ON THE IOWA TESTS OF BASIC SKILLS--MAP READING

C.R.	In favor of Control Group over:	In favor of Exp. Grp.I over:	In favor of Exp. Grp.II over:	In favor of Exp. Grp.III over:
3.00 and higher		Control Grp.(E.E.T.) Control Grp.(D.T.J.)	Control Grp.(E.E.T.) Exp.Grp.I (E.E.T.) Control Grp.(D.T.J.) Control Grp.(D.T.S.)	Control Grp.(E.E.T.) Exp.Grp.I (E.E.T.) Exp.Grp.II (E.E.T.) Control Grp.(D.T.J.) Exp.Grp.I (D.T.J.) Exp.Grp.II (D.T.J.) Control Grp.(D.T.S.) Exp.Grp.I (D.T.S.)
2.58-2.99				Exp.Grp.II (D.T.S.)
1.96-2.57				
1.95 and below	Exp.Grp.I (I.T.) Exp.Grp.II (I.T.) Exp.Grp.III (I.T.)	Exp.Grp.II (I.T.) Exp.Grp.III (I.T.) Control Grp.(D.T.S.)	Exp.Grp.III (I.T.) Exp.Grp.I (D.T.J.) Exp.Grp.I (D.T.S.)	

There were critical ratios of 1.95 and below in favor of the Control Group over Experimental Groups I, II, and III at the initial testing.

There were critical ratios of 3.00 and higher in favor of Experimental Group I over the Control Group at the end of the experimental teaching and at the delayed testing in June; and critical ratios of 1.95 and below over Experimental Groups II and III at the initial testing and over the Control Group at the delayed testing in September.

There were critical ratios of 3.00 and higher in favor of Experimental Group II over the Control Group at the end of the experimental teaching and at the delayed testings in June and September and over Experimental Group I at the end of the experimental teaching; and critical ratios of 1.95 and below over Experimental Group III at the initial testing and over Experimental Group I at the delayed testings in June and September.

There were critical ratios of 3.00 and higher in favor of Experimental Group III over the Control Group and Experimental Group I at the end of the experimental teaching and the delayed testings in June and September and over Experimental Group II at the end of the experimental teaching and the delayed testing in June; and a critical ratio between 2.58 and 2.99 over Experimental Group II at the delayed testing in September.

Table 95 shows a summary of critical ratios which were yielded at each phase of the testing on the Map Skills Test for the four groups.

For the purpose of this summary, the critical ratios are presented in four classifications: 1.95 and below, 1.96 to 2.57, 2.58 to 2.99, and 3.00 and higher.

The column heading designates the group which yielded the favoring critical ratio.

The following legend has been used:

I.T. = Initial Testing
E.E.T. = End of Experimental Teaching
D.T.J. = Delayed Testing in June
D.T.S. = Delayed Testing in September

TABLE 95

SUMMARY OF CRITICAL RATIOS ON THE MAP SKILLS TEST

C.R.	In favor of Control Group over:	In favor of Exp. Grp.I over:	In favor of Exp. Grp.II over:	In favor of Exp. Grp.III over:
3.00 and higher		Control Grp.(E.E.T.) Control Grp.(D.T.J.)	Control Grp.(E.E.T.) Exp.Grp.I (E.E.T.) Control Grp.(D.T.J.) Control Grp.(D.T.S.)	Control Grp.(E.E.T.) Exp.Grp.I (E.E.T.) Control Grp.(D.T.J.) Exp.Grp.I (D.T.J.) Exp.Grp.II (D.T.J.) Control Grp.(D.T.S.) Exp.Grp.I (D.T.S.)
2.58-2.99			Exp.Grp.I (D.T.J.) Exp.Grp.I (D.T.S.)	Exp.Grp.II (D.T.S.)
1.96-2.57		Control Grp.(D.T.S.)		
1.95 and below	Exp.Grp.I (I.T.) Exp.Grp.II (I.T.) Exp.Grp.III (I.T.)	Exp.Grp.II (I.T.) Exp.Grp.III (I.T.)		Exp.Grp.II (E.E.T.)

There were critical ratios of 1.95 and below in favor of the Control Group over Experimental Groups I, II, and III at the initial testing.

There were critical ratios of 3.00 and higher in favor of Experimental Group I over the Control Group at the end of the experimental teaching and at the delayed teaching in June; a critical ratio between 1.96 and 2.57 over the Control Group at the delayed testing in September; and critical ratios of 1.95 and below over Experimental Groups II and III at the initial testing.

There were critical ratios of 3.00 and higher in favor of Experimental Group II over the Control Group at the end of the experimental teaching and the delayed testings in June and September and over Experimental Group I at the end of the experimental teaching; and critical ratios between 2.58 and 2.99 over Experimental Group I at the delayed testings in June and September.

There were critical ratios of 3.00 and higher in favor of Experimental Group III over the Control Group and Experimental Group I at the end of the experimental teaching and the delayed testings in June and September, and over Experimental Group II at the delayed testing in June; a critical ratio between 2.58 and 2.99 over Experimental Group II at the delayed testing in September; and a critical ratio of 1.95 or below over Experimental Group II at the end of the experimental teaching.

Table 96 shows a comparison of mean chronological ages for boys and girls in the four groups.

TABLE 96

DISTRIBUTION AND COMPARISON OF CHRONOLOGICAL AGES OF BOYS AND GIRLS IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
138-140	2					1	1	1
135-137	1	1			1	2	1	
132-134	2		2		1	1	1	
129-131	1		2	1	2	1	1	2
126-128	3	1	4	1	5	2	2	1
123-125	3	3	5	1	4		4	3
120-122	4	2	3	2	4	1	1	3
117-119	7	4	10	3	8	1	4	4
114-116	8	1	5	5	2	3	8	3
111-113	13	13	8	15	8	9	9	10
108-110	17	16	14	8	11	12	14	12
105-107	12	10	10	5	15	17	8	10
102-104	9	7	14	8	12	10	8	13
99-101	7	7	6	5	6	7	5	4
N	89	65	83	54	79	67	67	66
Mean	112.37	109.92	112.00	110.33	111.88	109.85	112.05	110.68
S.D.	9.06	7.17	8.70	6.78	9.06	9.03	8.79	8.19
$S.E._m$	.960	.890	.955	.923	1.02	1.10	1.07	1.01
$Diff._m$	2.45		1.67		2.03		1.37	
$S.E._d$	1.31		1.33		1.50		1.47	
C.R.	1.87		1.26		1.35		.932	

A comparison of the mean chronological ages of boys and girls indicates no significant difference.

Table 97 shows a comparison of mean mental ages for boys and girls in the four groups.

TABLE 97

DISTRIBUTION AND COMPARISON OF MENTAL AGES OF BOYS AND GIRLS IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
141-143		2				1		1
138-140	1		1	1		1		
135-137	1	1	2		1	1	1	1
132-134	1	2	2	1	2	3	2	2
129-131	3	3	4	2	3	3	3	3
126-128	2	2	8	8	4	5	11	6
123-125	16	10	6	4	13	10	5	10
120-122	11	16	9	10	10	11	10	9
117-119	10	8	18	4	8	4	4	11
114-116	13	11	7	8	13	7	2	5
111-113	14	6	14	8	11	7	10	6
108-110	13	2	10	4	7	12	12	7
105-107	1	1	1	1	5	1	5	3
102-104	3	1	1	3	2	1	2	2
N	89	65	83	54	79	67	67	66
Mean	117.33	120.21	118.58	118.39	117.62	119.25	117.69	119.04
S.D.	7.29	7.38	7.59	7.86	7.41	8.52	8.52	8.13
$S.E._m$	.773	.916	.833	1.07	.834	1.04	1.04	1.00
$Diff._m$	2.88		.19		1.63		1.35	
$S.E._d$	1.20		1.36		1.33		1.44	
C.R.	2.40		.14		1.23		.94	

A comparison of the mean mental ages of boys and girls indicates no significant difference.

Table 98 shows a comparison of mean scores for boys and girls on the initial testing of the Map Reading section of the Iowa Tests of Basic Skills in the four groups.

TABLE 98

DISTRIBUTION AND COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
57-59						1		
54-56			1					
51-53								
48-50						1		
45-47			1					
42-44						3		1
39-41			2				2	2
36-38	1		2	2	1	2	1	1
33-35	5	4	4	3	5	1	4	4
30-32	8	6	6	2	4	1	5	3
27-29	6	9	5	3	9	9	6	6
24-26	15	7	14	8	9	5	8	5
21-23	16	6	9	5	8	7	10	8
18-20	12	14	10	10	12	9	10	7
15-17	9	9	13	7	15	15	11	10
12-14	12	7	9	10	10	10	4	12
9-11	3	2	6	2	5	2	2	4
6- 8		1		1	1		2	2
3- 5	2			1		1	2	1
0- 2			1					
N	89	65	83	54	79	67	67	66
Mean	21.53	21.68	22.18	20.28	20.75	23.30	21.73	20.68
S.D.	7.05	6.75	9.00	7.53	7.08	9.72	8.04	8.73
$S.E._m$	.748	.837	.988	1.02	.796	1.19	.982	1.08
$Diff._m$	.15		1.90		2.55		1.05	
$S.E._d$	1.12		1.42		1.43		1.46	
C.R.	.13		1.34		1.78		.72	

A comparison of mean scores on the initial testing of the Map Reading section of the Iowa Tests of Basic Skills indicates that there was no significant difference.

Table 99 shows a comparison of mean scores for boys and girls on the Map Reading section of the Iowa Tests of Basic Skills at the close of the experimental teaching period in the four groups.

TABLE 99

DISTRIBUTION AND COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE CLOSE OF THE EXPERIMENTAL PERIOD IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
63-65							3	
60-62			1					1
57-59						1	1	2
54-56				1				2
51-53			1				2	3
48-50			3		1	2	5	2
45-47			1		1	2	4	2
42-44			2	2	5	1	6	3
39-41		1	4		8	5	10	7
36-38	2	1	4	4	10	10	3	10
33-35	3	2	3	4	16	9	7	5
30-32	5	9	11	6	9	11	8	7
27-29	20	5	21	8	17	14	9	8
24-26	10	12	10	7	4	8	3	7
21-23	16	8	7	10	4		4	3
18-20	14	11	5	7	4	4	1	
15-17	10	5	4	3				2
12-14	6	8	3	1			1	2
9-11	3	1	1	1				
6- 8			1					
3- 5		2	1					
N	89	65	83	54	79	67	67	66
Mean	22.77	22.32	28.36	28.56	32.44	32.48	37.09	38.82
S.D.	6.21	7.41	9.93	8.13	6.60	7.41	10.74	10.89
$S.E._m$	.659	.919	1.09	1.11	.742	.905	1.31	1.34
$Diff._m$	.45		.20		.04		1.73	
$S.E._d$	1.13		1.56		1.17		1.87	
C.R.	.40		.13		.03		.93	

A comparison of mean scores on the Map Reading section of the Iowa Tests of Basic Skills at the close of the experimental teaching period indicates that there was no significant difference at the .01 level of confidence between boys and girls in the four groups.

Table 100 shows a comparison of mean scores for boys and girls on the Map Reading section of the Iowa Tests of Basic Skills at the delayed testing in June in the four groups.

TABLE 100

DISTRIBUTION AND COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE DELAYED TESTING IN JUNE IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
66-68								1
63-65							2	1
60-62			1			1	2	3
57-59			2				1	1
54-56					1	2	1	2
51-53	1			1	1		5	
48-50		1	1	1		1	5	3
45-47	2		1	2	3	3	4	4
42-44		2	5		3	2	5	4
39-41	1	5	7	3	7	3	5	4
36-38	3	3	11	4	10	4	7	7
33-35	6	5	9	6	9	8	1	5
30-32	10	6	10	6	11	14	10	9
27-29	19	11	7	10	12	7	7	7
24-26	17	8	12	6	14	7	3	6
21-23	15	10	6	7	5	9	3	1
18-20	12	6	3	7	1	3	3	5
15-17	3	7	5	1	2	3	2	3
12-14			3				1	
9-11		1						
N	89	65	83	54	79	67	67	66
Mean	26.65	27.17	31.25	29.33	32.06	31.23	37.45	35.83
S.D.	6.57	8.13	9.93	8.19	7.56	9.42	12.36	12.45
$S.E._m$	.697	1.01	1.09	1.11	.850	1.15	1.51	1.53
$Diff._m$	.52		1.92		.83		1.62	
$S.E._d$	1.23		1.56		1.43		2.15	
C.R.	.42		1.23		.58		.75	

A comparison of mean scores on the Map Reading section of the Iowa Tests of Basic Skills at the delayed testing in June indicates that there was no significant difference at the .01 level of confidence between boys and girls in the four groups.

Table 101 shows a comparison of mean scores for boys and girls on the initial testing of the Map Skills Test in the four groups.

TABLE 101

DISTRIBUTION AND COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON THE INITIAL TESTING OF THE MAP SKILLS TEST IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
48-50			1					
45-47								
42-44	1		2		1	1	1	
39-41	1	2				1	1	1
36-38		3	3	1	2	2	1	3
33-35	2	1	4	3	3	2	4	1
30-32	4	3	7	5	3	5	4	3
27-29	8	3	8	7	4	5	10	2
24-26	20	8	13	5	5	10	6	6
21-23	13	16	8	4	23	11	8	12
18-20	13	11	8	5	13	11	9	14
15-17	14	11	12	8	13	10	12	15
12-14	7	4	7	5	6	6	8	8
9-11	6	1	6	8	4	2	2	1
6- 8		1	3	3	1	1		
3- 5		1					1	
0- 2			1		1			
N	89	65	83	54	79	67	67	66
Mean	21.43	21.72	22.18	20.22	20.71	22.18	22.05	20.73
S.D.	6.60	7.23	9.12	8.34	7.05	7.35	7.80	6.60
$S.E._m$	.700	.897	1.00	1.13	.793	.897	.952	.813
$Diff._m$	.29		1.96		1.47		1.32	
$S.E._d$	1.14		1.51		1.20		1.25	
C.R.	.25		1.30		1.23		1.06	

A comparison of mean scores on the initial testing of the Map Skills Test indicates that there was no significant difference at the .01 level of confidence between boys and girls in the four groups.

Table 102 shows a comparison of mean scores for boys and girls on the Map Skills Test at the close of the experimental teaching period in the four groups.

TABLE 102

DISTRIBUTION AND COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON THE MAP SKILLS TEST AT THE CLOSE OF THE EXPERIMENTAL TEACHING PERIOD IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
51-53			3	2	4	6	7	7
48-50			8	1	14	4	13	12
45-47	1	1	9	5	5	13	11	10
42-44	1	2	7	8	16	13	12	8
39-41		4	14	8	15	12	10	8
36-38	2	2	9	3	9	11	4	11
33-35	3	2	8	6	7	3	4	4
30-32	8	3	11	6	2	3	3	3
27-29	11	8	5	6	4	1	2	3
24-26	10	9	1	4	2	1		
21-23	9	10	3	3	1		1	
18-20	23	12	2	1				
15-17	15	6	1	1				
12-14	5	6	2					
9-11	1							
N	89	65	83	54	79	67	67	66
Mean	22.71	24.58	37.12	35.50	40.87	41.79	42.96	42.36
S.D.	6.93	8.31	9.09	8.61	6.96	5.97	6.72	6.69
$S.E._m$	.735	1.03	.998	1.17	.783	.729	.821	.824
$Diff._m$	1.87		1.62		.92		.60	
$S.E._d$	1.27		1.54		1.07		1.16	
C.R.	1.47		1.05		.86		.52	

A comparison of mean scores on the Map Skills Test at the close of the experimental teaching period indicates that there was no significant difference at the .01 level of confidence between boys and girls in the four groups.

Table 103 shows a comparison of mean scores for boys and girls on the Map Skills Test at the delayed testing in June in the four groups.

TABLE 103

DISTRIBUTION AND COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON THE MAP SKILLS TEST AT THE DELAYED TESTING IN JUNE IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
51-53			10	3	3	3	15	10
48-50	4	1	9	5	10	5	6	8
45-47	2	4	8	4	14	9	16	10
42-44	7	5	6	6	10	9	7	6
39-41	9	6	11	5	13	14	6	14
36-38	5	7	14	5	8	9	7	7
33-35	8	8	8	7	4	7	2	10
30-32	10	9	3	2	3	7	1	
27-29	13	8	5	6	5	3	3	1
24-26	13	8	3	2	3	1	1	
21-23	6	4	2	6	5		2	
18-20	7	4	1	1	1			
15-17	2		2	2			1	
12-14	3		1					
9-11		1						
N	89	65	83	54	79	67	67	66
Mean	30.80	32.26	38.95	35.72	39.36	39.69	42.96	42.68
S.D.	9.00	8.19	9.48	9.96	8.52	6.45	8.46	6.27
$S.E._m$	.959	1.02	1.04	1.36	.958	.788	1.03	.772
$Diff._m$	1.46		3.23		.33		.28	
$S.E._d$	1.40		1.71		1.24		1.29	
C.R.	1.04		1.89		.27		.22	

A comparison of mean scores on the Map Skills Test at the delayed testing in June indicates that there was no significant difference at the .01 level of confidence between boys and girls in the four groups.

Table 104 shows a comparison of mean scores for boys and girls on the Social Studies Fact Test at the delayed testing in June in the four groups.

TABLE 104

DISTRIBUTION AND COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON THE SOCIAL STUDIES FACT TEST AT THE DELAYED TESTING IN JUNE IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
140-149	1	1	1		1	3	2	2
130-139	5	5	4		9	4	10	10
120-129	9	5	8	3	10	10	9	11
110-119	5	2	9	8	21	13	16	6
100-109	7	6	9	4	10	13	10	9
90- 99	8	8	12	6	13	11	9	13
80- 89	20	8	11	7	2	5	8	7
70- 79	10	10	13	4	4	5	3	6
60- 69	9	11	4	10	3	3		1
50- 59	7	3	5	6	3			
40- 49	4	4	6	4	3			1
30- 39	4	1		2				
20- 29		1	1					
N	89	65	83	54	79	67	67	66
Mean	86.63	85.88	90.40	81.16	104.25	105.84	110.17	106.20
S.D.	27.10	27.60	26.20	25.40	24.50	19.70	18.10	21.90
$S.E._m$	2.87	3.43	2.88	3.46	2.76	2.41	2.21	2.70
$Diff._m$	.75		9.24		1.59		3.97	
$S.E._d$	4.47		4.50		3.66		3.49	
C.R.	.17		2.05		.43		1.13	

A comparison of mean scores on the Social Studies Fact Test at the delayed testing in June indicates that there was no significant difference at the .01 level of confidence between boys and girls in the four groups.

Table 105 shows a comparison of mean scores for boys and girls on the Social Studies Fact Test at the delayed testing in September in the four groups.

TABLE 105

DISTRIBUTION AND COMPARISON OF MEAN SCORES FOR BOYS AND GIRLS ON THE SOCIAL STUDIES FACT TEST AT THE DELAYED TESTING IN SEPTEMBER IN THE FOUR GROUPS

	Control Group		Experimental Group I		Experimental Group II		Experimental Group III	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
140-149						2	1	3
130-139	3	4	6		7	2	9	5
120-129	7	1	6	2	7	4	13	5
110-119	6	8	7	2	14	10	4	10
100-109	15	8	6	5	11	11	9	5
90- 99	7	10	9	9	8	11	8	10
80- 89	15	8	12	10	6	7	9	2
70- 79	7	9	10	7	10	9	5	8
60- 69	8	6	12	5	3	2	5	6
50- 59	7	5	5	1	1	1	2	1
40- 49	6	1	2	3	3	1		1
30- 39	1	1	3	2	2			
20- 29	1							
N	83	61	78	46	72	60	65	56
Mean	86.80	89.25	87.57	82.54	97.14	98.00	102.96	99.86
S.D.	26.00	23.40	26.40	21.40	25.80	21.00	23.90	25.30
$S.E._m$	2.85	3.00	2.99	3.16	3.04	2.71	2.97	3.38
$Diff._m$	2.45		5.03		.86		3.10	
$S.E._d$	4.14		4.35		4.07		4.50	
C.R.	.59		1.16		.21		.69	

A comparison of mean scores on the Social Studies Fact Test at the delayed testing in September indicates that there was no significant difference at the .01 level of confidence between boys and girls in the four groups.

Tables 106 through 109 show a comparison of mean scores for the lower quarter of the intelligence quotients of each group on the Map Reading section of the Iowa Tests of Basic Skills at the initial testing and at the end of the experimental teaching period.

TABLE 106

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE LOWER QUARTER OF THE CONTROL GROUP

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	38	17.90	6.54	1.06	4.02	1.48	2.72
E.E.T.	Control	38	21.92	6.39	1.04			

TABLE 107

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE LOWER QUARTER OF EXPERIMENTAL GROUP I

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	34	17.15	6.75	1.16	4.49	1.68	2.67
E.E.T.	Exp.Grp.I	34	21.64	7.05	1.21			

TABLE 108

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE LOWER QUARTER OF EXPERIMENTAL GROUP II

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	36	18.42	6.03	1.01	11.66	1.46	7.99
E.E.T.	Exp.Grp.II	36	30.08	6.33	1.06			

TABLE 109

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE LOWER QUARTER OF EXPERIMENTAL GROUP III

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	33	15.36	6.51	1.13	17.73	1.81	9.80
E.E.T.	Exp.Grp.III	33	33.09	8.16	1.42			

In the lower quarter of intelligence quotients of the Control Group from the initial testing to the end of the experimental teaching period there was a gain of 4.02, which resulted in a critical ratio of 2.72. This difference was statistically significant at the .01 level of confidence.

All experimental groups made gains which were significant at the .01 level of confidence. In Experimental Group I, the difference of 4.49 resulted in a critical ratio of 2.67; in Experimental Group II, the difference of 11.66 resulted in a critical ratio of 7.99; and in Experimental Group III, the difference of 17.73 resulted in a critical ratio of 9.80.

The critical ratios became progressively larger, favoring Experimental Groups III, II, and I, respectively.

Tables 110 through 113 show a comparison of mean scores for the lower quarter of intelligence quotients of each group on the Map Reading section of the Iowa Tests of Basic Skills at the initial testing and at the delayed testing in June.

TABLE 110

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE LOWER QUARTER OF THE CONTROL GROUP

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	38	17.90	6.54	1.06	7.65	1.33	5.75
D.T.	Control	38	25.55	4.92	.799			

TABLE 111

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE LOWER QUARTER OF EXPERIMENTAL GROUP I

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	34	17.15	6.75	1.16	8.73	1.74	5.02
D.T.	Exp.Grp.I	34	25.88	7.59	1.30			

TABLE 112

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE LOWER QUARTER OF EXPERIMENTAL GROUP II

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	36	18.42	6.03	1.01	9.58	1.54	6.22
D.T.	Exp.Grp.II	36	28.00	6.96	1.16			

TABLE 113

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE LOWER QUARTER OF EXPERIMENTAL GROUP III

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	33	15.36	6.51	1.13	15.09	1.95	7.74
D.T.	Exp.Grp.III	33	30.45	9.12	1.59			

In all groups of the lower quarter of intelligence quotients from the initial testing to the delayed testing in June there were statistically significant gains at the .01 level of confidence.

In the Control Group the difference of 7.65 resulted in a critical ratio of 5.75; in Experimental Group I, the difference of 8.73 resulted in a critical ratio of 5.02; in Experimental Group II, the difference of 9.58 resulted in a critical ratio of 6.22; and in Experimental Group III, the difference of 15.09 resulted in a critical ratio of 7.74.

The critical ratios became progressively larger, favoring Experimental Group III, Experimental Group II, the Control Group, and Experimental Group I, respectively.

Tables 114 through 117 show a comparison of mean scores for the lower quarter of intelligence quotients of each group on the Map Skills Test at the initial testing and at the end of the experimental teaching period.

TABLE 114

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE LOWER QUARTER OF THE CONTROL GROUP

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	38	19.55	5.46	.886	2.69	1.15	2.34
E.E.T.	Control	38	22.24	4.47	.726			

TABLE 115

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE LOWER QUARTER OF EXPERIMENTAL GROUP I

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	34	18.47	7.98	1.37	13.33	2.12	6.29
E.E.T.	Exp.Grp.I	34	31.80	9.42	1.62			

TABLE 116

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE LOWER QUARTER OF EXPERIMENTAL GROUP II

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	36	20.25	5.64	.940	17.08	1.59	10.74
E.E.T.	Exp.Grp.II	36	37.33	7.65	1.28			

TABLE 117

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE LOWER QUARTER OF EXPERIMENTAL GROUP III

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	33	18.18	5.13	.892	20.46	1.43	14.31
E.E.T.	Exp.Grp.III	33	38.64	6.45	1.12			

In the lower quarter of intelligence quotients of the Control Group from the initial testing to the end of the experimental teaching period, there was a gain of 2.69 which resulted in a critical ratio of 2.34. Although statistically significant at the .05 level of confidence, there was no significance at the .01 level.

All experimental groups made gains which were significant at the .01 level of confidence. In Experimental Group I, the difference of 13.33 resulted in a critical ratio of 6.29; in Experimental Group II, the difference of 17.08 resulted in a critical ratio of 10.74; in Experimental Group III, the difference of 20.46 resulted in a critical ratio of 14.31.

The critical ratios became progressively larger, favoring Experimental Groups III, II, and I, respectively.

Tables 118 through 121 show a comparison of mean scores for the lower quarter of intelligence quotients of each group on the Map Skills Test at the initial testing and at the delayed testing in June.

TABLE 118

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE LOWER QUARTER OF THE CONTROL GROUP

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	38	19.55	5.46	.886	7.98	1.45	5.50
D.T.	Control	38	27.53	7.11	1.15			

TABLE 119

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE LOWER QUARTER OF EXPERIMENTAL GROUP I

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	34	18.47	7.98	1.37	16.41	2.08	7.89
D.T.	Exp.Grp.I	34	34.88	9.15	1.57			

TABLE 120

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE LOWER QUARTER OF EXPERIMENTAL GROUP II

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	36	20.25	5.64	.940	14.50	1.70	8.53
D.T.	Exp.Grp.II	36	34.75	8.49	1.42			

TABLE 121

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE LOWER QUARTER OF EXPERIMENTAL GROUP III

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	33	18.18	5.13	.892	20.28	1.59	12.75
D.T.	Exp.Grp.III	33	38.46	7.56	1.31			

In all groups of the lower quarter of intelligence quotients from the initial testing to the delayed testing in June there were statistically significant gains at the .01 level of confidence.

In the Control Group, the difference of 7.98 resulted in a critical ratio of 5.50; in Experimental Group I, the difference of 16.41 resulted in a critical ratio of 7.89; in Experimental Group II, the difference of 14.50 resulted in a critical ratio of 8.53; in Experimental Group III, the difference of 20.28 resulted in a critical ratio of 12.75.

The critical ratios became progressively larger, favoring Experimental Groups III, II, and I, and the Control Group, respectively.

Tables 122 through 125 show a comparison of mean scores for the upper quarter of intelligence quotients of each group on the Map Reading section of the Iowa Tests of Basic Skills at the initial testing and at the end of the experimental teaching period.

TABLE 122

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE UPPER QUARTER OF THE CONTROL GROUP

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	38	23.97	7.32	1.19	3.56	1.68	2.12
E.E.T.	Control	38	27.53	7.32	1.19			

TABLE 123

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE UPPER QUARTER OF EXPERIMENTAL GROUP I

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	34	25.18	9.33	1.60	3.41	2.42	1.41
E.E.T.	Exp.Grp.I	34	28.59	10.56	1.81			

TABLE 124

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE UPPER QUARTER OF EXPERIMENTAL GROUP II

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	36	23.42	11.77	1.96	12.08	2.37	5.10
E.E.T.	Exp.Grp.II	36	35.50	7.95	1.33			

TABLE 125

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE UPPER QUARTER OF EXPERIMENTAL GROUP III

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	33	22.18	7.80	1.36	20.73	2.27	9.13
E.E.T.	Exp.Grp.III	33	42.91	10.47	1.82			

In the upper quarter of intelligence quotients of the Control Group from the initial testing to the end of the experimental teaching period there was a gain of 3.56, which resulted in a critical ratio of 2.12. Although statistically significant at the .05 level of confidence, there was no significance at the .01 level.

In Experimental Group I, the gain of 3.41 resulted in a critical ratio of 1.41, which was not statistically significant.

In Experimental Group II, the gain of 12.08 resulted in a critical ratio of 5.10; in Experimental Group III, the gain of 20.73 resulted in a critical ratio of 9.13. These gains were highly significant at the .01 level of confidence.

Tables 126 through 129 show a comparison of mean scores for the upper quarter of intelligence quotients of each group on the Map Reading section of the Iowa Tests of Basic Skills at the initial testing and at the delayed testing in June.

TABLE 126

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE UPPER QUARTER OF THE CONTROL GROUP

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	38	23.97	7.32	1.19	6.72	1.82	3.69
D.T.	Control	38	30.69	8.52	1.38			

TABLE 127

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE UPPER QUARTER OF EXPERIMENTAL GROUP I

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	34	25.18	9.33	1.60	7.32	2.32	3.16
D.T.	Exp.Grp.I	34	32.50	9.81	1.68			

TABLE 128

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE UPPER QUARTER OF EXPERIMENTAL GROUP II

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	36	23.42	11.77	1.96	12.91	2.58	5.00
D.T.	Exp.Grp.II	36	36.33	10.05	1.68			

TABLE 129

COMPARISON OF MEAN SCORES ON THE MAP READING SECTION OF THE IOWA TESTS OF BASIC SKILLS AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE UPPER QUARTER OF EXPERIMENTAL GROUP III

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	33	22.18	7.80	1.36	22.82	2.44	9.35
D.T.	Exp.Grp.III	33	45.00	11.64	2.02			

In all groups of the upper quarter of intelligence quotients from the initial testing to the delayed testing in June there were statistically significant gains at the .01 level of confidence.

In the Control Group, the difference of 6.72 resulted in a critical ratio of 3.69; in Experimental Group I, the difference of 7.32 resulted in a critical ratio of 3.16; in Experimental Group II, the difference of 12.91 resulted in a critical ratio of 5.00; in Experimental Group III, the difference of 22.82 resulted in a critical ratio of 9.35.

The critical ratios became progressively larger, favoring Experimental Group III, Experimental Group II, the Control Group, and Experimental Group I, respectively.

Tables 130 through 133 show a comparison of mean scores for the upper quarter of intelligence quotients of each group on the Map Skills Test at the initial testing and at the close of the experimental teaching period.

TABLE 130

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE UPPER QUARTER OF THE CONTROL GROUP

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	38	28.00	7.92	1.29	3.32	1.94	1.71
E.E.T.	Control	38	31.32	8.91	1.45			

TABLE 131

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE UPPER QUARTER OF EXPERIMENTAL GROUP I

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	34	28.44	8.25	1.42	14.47	1.75	8.27
E.E.T.	Exp.Grp.I	34	42.91	5.97	1.02			

TABLE 132

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE UPPER QUARTER OF EXPERIMENTAL GROUP II

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	36	27.83	7.71	1.29	17.42	1.57	11.10
E.E.T.	Exp.Grp.II	36	45.25	5.37	.895			

TABLE 133

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE END OF THE EXPERIMENTAL TEACHING PERIOD OF THE UPPER QUARTER OF EXPERIMENTAL GROUP III

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	33	27.64	8.04	1.40	19.18	1.77	10.84
E.E.T.	Exp.Grp.III	33	46.82	6.24	1.09			

In the upper quarter of intelligence quotients of the Control Group from the initial testing to the end of the experimental teaching period there was a gain of 3.32, which resulted in a critical ratio of 1.71. This was not statistically significant.

All experimental groups made gains which were significant at the .01 level of confidence. In Experimental Group I, the difference of 14.47 resulted in a critical ratio of 8.27; in Experimental Group II, the difference of 17.42 resulted in a critical ratio of 11.10; in Experimental Group III, the difference of 19.18 resulted in a critical ratio of 10.84.

The critical ratios became progressively larger, favoring Experimental Groups II, III, and I, respectively.

Tables 134 through 137 show a comparison of mean scores for the upper quarter of intelligence quotients of each group on the Map Skills Test at the initial testing and at the delayed testing in June.

TABLE 134

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE UPPER QUARTER OF THE CONTROL GROUP

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Control	38	28.00	7.92	1.29	11.92	1.82	6.55
D.T.	Control	38	39.92	7.92	1.29			

TABLE 135

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE UPPER QUARTER OF EXPERIMENTAL GROUP I

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.I	34	28.44	8.25	1.42	15.62	1.93	8.09
D.T.	Exp.Grp.I	34	44.06	7.59	1.30			

TABLE 136

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE UPPER QUARTER OF EXPERIMENTAL GROUP II

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.II	36	27.83	7.71	1.29	16.59	1.56	10.63
D.T.	Exp.Grp.II	36	44.42	5.28	.880			

TABLE 137

COMPARISON OF MEAN SCORES ON THE MAP SKILLS TEST AT THE INITIAL TESTING AND AT THE DELAYED TESTING IN JUNE OF THE UPPER QUARTER OF EXPERIMENTAL GROUP III

	Group	No.	Mean	S.D.	$S.E._m$	$Diff._m$	$S.E._d$	C.R.
I.T.	Exp.Grp.III	33	27.64	8.04	1.40	19.73	1.68	11.74
D.T.	Exp.Grp.III	33	47.37	5.34	.929			

In all groups of the upper quarter of intelligence quotients from the initial testing to the delayed testing in June there were statistically significant gains at the .01 level of confidence.

In the Control Group, the difference of 11.92 resulted in a critical ratio of 6.55; in Experimental Group I, the difference of 15.62 resulted in a critical ratio of 8.09; in Experimental Group II, the difference of 16.59 resulted in a critical ratio of 10.63; in Experimental Group III, the difference of 19.73 resulted in a critical ratio of 11.74.

The critical ratios became progressively larger, favoring Experimental Groups III, II, and I, and the Control Group, respectively.

Evaluation of the Procedure

The pupils and teachers who comprised the three experimental groups were requested to evaluate the materials and techniques.

Pupil Evaluation

Table 138 shows the results of the pupil questionnaire.

TABLE 138

PUPIL QUESTIONNAIRE

	Experimental Group I N = 137				Experimental Group II N = 146				Experimental Group III N = 133			
	Yes		No		Yes		No		Yes		No	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Considered team work fun					134	92	12	8	124	93	9	7
New friends because of team work					94	64	41	28	63	47	70	53
Enjoyed the lessons	130	95	7	5	144	99	2	1	131	99	2	1
Map work now easier	135	99	2	1	146	100	0	0	131	99	2	1
Prefer teacher explaining and correcting	33	24			27	18			23	17		
Prefer self-direction and correction	104	76			119	82			110	83		
Would like to try team work in other subjects					131	90	15	10	112	84	21	16
Attempted extra map work	109	80	28	20	118	81	28	19	110	83	23	17
Able to read maps more easily	106	77	31	13	138	95	8	5	109	82	24	18

The following responses were summarized and combined in cases of similarity:

1. The children who stated that they had enjoyed the lessons felt that they were interesting and fun. They commented that working in groups had helped them to learn more and had made the work easier. Some felt that helping each other had made them "smarter."
2. The children who reacted negatively to the lessons stated that they did not like their partner, or the lessons were either too hard or too easy.
3. The children showed initiative beyond the lessons in using road maps, world maps and atlases, making new maps with parents, and constructing papier mache maps. They indicated a great deal of interest in using maps to find states, countries, and continents which they had read about in newspapers.

A copy of the questionnaire may be found on page 59.

Teacher Evaluation

*1. All teachers in the experiment stated that they had enjoyed participating in the study.

2. The features of the study enjoyed most included: the general presentation, the plan of the lessons, the variety of activ-

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*Indicates the response to the question on the Teacher Evaluation Form. A copy of the questionnaire may be found on page 61.

ities, the repetition of learnings, the enthusiasm of the children.

3. The features of the study not enjoyed included ground distance and measurement.
4. The teachers suggested that more time could have been allotted for the improvement of the lessons. They also requested that the lessons be prepared in a permanent form for reuse of material.
5. Of the eighteen classes in the experimental groups, seven had carried on some team work before the study.
6. The team work had been attempted in arithmetic problems, arithmetic fundamentals, social studies, spelling, and reading.
7. In Experimental Group II, three teachers indicated they would continue team work in social studies, one was uncertain, one said she would not, and one did not respond. In Experimental Group III, three teachers indicated they would continue team work in social studies, and three were uncertain.
8. These teachers indicated that they would like to try team work in arithmetic, reading, spelling, science, language, and social studies.
9. There was some social improvement noted in all classes.
10. Where ineffective groups existed, they were mainly due to slow children working together, absenteeism, and personality conflicts.

11. All teachers indicated a more wholesome attitude toward maps in their classes due to the lessons.

12a. All teachers indicated that children had shown initiative beyond the lessons to do extra map work.

12b. Teachers responded that children had brought maps to school, made maps, ventured freely to wall maps and the globe, and had purchased maps, globes, and atlases.

13. All teachers stated they would use the lessons to supplement the textbook study of maps throughout the year.

14. All teachers felt that children were using maps and globes more freely than had previous classes.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

The purpose of this study was to develop and evaluate a planned program in social studies to teach basic map skills in the fourth grade using varied-size groups of individuals, pairs, and teams of three.

The experiment was carried on during an intensive teaching program of twenty-seven days, or five and one half weeks. The lessons were grouped into six weekly work units.

The population was divided into four groups, consisting of a control group and three experimental groups. The Control Group followed their prescribed social studies program, with no deviation from their general course of study. Forty minutes per day were devoted to the social studies period.

The three experimental groups were designated Experimental Group I, Experimental Group II, and Experimental Group III. All children in the three experimental groups received the same self-directed map skills lessons and worked on them without teacher aid. These children had no additional instruction in social studies throughout the intensive teaching phase of the study. Forty minutes per day were devoted to the lessons.

The three experimental groups differed in that the children in Experimental Group I worked on the lessons alone; those in Experimental Group II worked in pairs; and those in Experimental Group III worked in

teams of three.

The lessons were adapted for team learning, self-direction, and economy of time. The major responsibilities of the teachers of experimental classes were to arrange heterogeneous groups for the pairs and teams of three and to see that the groups were working effectively. The lessons were done on the lesson sheets and maintained in a personal folder for future reference.

The study was carried on in an industrial city within a twenty-five-mile radius of Boston. Twenty-five of the forty-four fourth grade classes participated, with seven classes designated as the Control Group, six classes as Experimental Group I, six classes as Experimental Group II, and six classes as Experimental Group III.

The ability and achievement of the Control Group and the three experimental groups were measured at the beginning of the experiment in October 1960, at the end of the intensive teaching period in November, at the end of the school year in June 1961, and again at the beginning of the next school year in September 1961.

The tests administered in each phase of the testing included the Map Reading section of the Iowa Tests of Basic Skills (Form 1 and Form 2) and a Map Skills Test constructed by the writer. A Social Studies Fact Test was also administered at the delayed testing in June and again in September. The Kuhlmann-Anderson Test was the intelligence test administered as part of the regular testing program of the community; therefore, these results were used in the study. Groups were equated on the bases of initial results of mean chronological ages and mental ages, and

mean scores on the Map Reading section of the Iowa Test of Basic Skills (Form 2) and the Map Skills Test.

Although there were 766 children in the original population, illness, transfers, drop-outs, and equating procedures reduced the population to 570: 154 in the Control Group, 137 in Experimental Group I, 146 in Experimental Group II, and 133 in Experimental Group III. The data for the initial tests, the tests at the close of the experimental teaching period, and the delayed testing in June were based on this population.

Illness, summer transfers, and summer drop-outs reduced the population at the September delayed testing to 521: 144 in the Control Group, 124 in Experimental Group I, 132 in Experimental Group II, and 121 in Experimental Group III.

Conclusions

I. The following conclusions may be drawn from comparisons among all the groups on the Iowa Map Reading section and the Map Skills Test at each phase of the testing:

A. At the end of the experimental teaching period:

1. Every experimental group showed highly significant differences at the .01 level when compared with the Control Group. Greatest gains were made by Experimental Groups III, II, and I, respectively.

a. Experimental Group I showed a mean difference of 6.23, with a standard error of .89, which resulted in a critical ratio

of 7.00 on the Iowa: Map Reading section. The mean difference of 12.98, with a standard error of .98, resulted in a critical ratio of 13.24 on the Map Skills Test.

b. Experimental Group II showed a mean difference of 11.04, with a standard error of .79, which resulted in a critical ratio of 13.97 on the Iowa: Map Reading section. The mean difference of 17.79, with a standard error of .82, resulted in a critical ratio of 21.70 on the Map Skills Test.

c. Experimental Group III showed a mean difference of 14.71, with a standard error of 1.09, which resulted in a critical ratio of 13.50 on the Iowa: Map Reading section. The mean difference of 19.16, with a standard error of .81, resulted in a critical ratio of 23.65 on the Map Skills Test.

2. Experimental Groups II and III showed highly significant differences in their favor when compared with Experimental Group I.

a. Experimental Group II showed a mean difference of 4.81, with a standard error of .92, which resulted in a critical ratio of 5.23 on the Iowa: Map Reading section. The mean difference of 4.81, with a standard error of .94, resulted in a critical ratio of 5.12 on the Map Skills Test.

b. Experimental Group III showed a mean difference of 8.48, with a standard error of 1.18, which resulted in a critical ratio of 7.19 on the Iowa: Map Reading section. The mean difference of 6.18, with a standard error of .93, resulted in a critical ratio of 6.65 on the Map Skills Test.

3. A comparison between Experimental Groups II and III showed differences which favored Experimental Group III.
   a. On the Iowa: Map Reading section there was a mean difference of 3.67, with a standard error of 1.10. The critical ratio of 3.34 was significant at the .01 level.
   b. On the Map Skills Test there was a mean difference of 1.37, with a standard error of .76. The critical ratio of 1.80 was not significant.

B. At the delayed testing in June:
   1. Every experimental group showed highly significant differences at the .01 level when compared with the Control Group. Greatest gains were made by Experimental Groups III, II, and I, respectively.
      a. Experimental Group I showed a mean difference of 3.62, with a standard error of .99, which resulted in a critical ratio of 3.66 on the Iowa: Map Reading section. The mean difference of 5.37, with a standard error of 1.07, resulted in a critical ratio of 5.02 on the Map Skills Test.
      b. Experimental Group II showed a mean difference of 4.71, with a standard error of .92, which resulted in a critical ratio of 5.12 on the Iowa: Map Reading section. The mean difference of 8.09, with a standard error of .94, resulted in a critical ratio of 8.61 on the Map Skills Test.
      c. Experimental Group III showed a mean difference of 9.77, with a standard error of 1.23, which resulted in a critical ratio

of 7.94 on the Iowa: Map Reading section. The mean difference of 11.40, with a standard error of .95, resulted in a critical ratio of 12.00 on the Map Skills Test.

2. A comparison between Experimental Groups I and II showed differences which favored Experimental Group II.
   a. On the Iowa: Map Reading section there was a mean difference of 1.09, with a standard error of 1.07. The critical ratio of 1.02 was not statistically significant.
   b. On the Map Skills Test there was a mean difference of 2.72, with a standard error of 1.02. The critical ratio of 2.67 was significant at the .01 level.
3. The gains made by Experimental Group III were highly significant when compared with the gains of Experimental Groups I and II.
   a. When compared with Experimental Group I, there was a mean difference of 6.15, with a standard error of 1.34, which resulted in a critical ratio of 4.59 on the Iowa: Map Reading section. The mean difference of 6.03, with a standard error of 1.03, resulted in a critical ratio of 5.85 on the Map Skills Test.
   b. When compared with Experimental Group II, there was a mean difference of 5.06, with a standard error of 1.29, which resulted in a critical ratio of 3.92 on the Iowa: Map Reading section. The mean difference of 3.31, with a standard error of .91, resulted in a critical ratio of 3.64 on the Map Skills Test.

C. At the delayed testing in September (ten months after the close of the intensive teaching period):

1. There was no significant difference at the .01 level between the Control Group and Experimental Group I.

   a. On the Iowa: Map Reading section the mean difference of 1.95 favored Experimental Group I. The standard error of 1.14 resulted in a critical ratio of 1.71, which was not significant.

   b. On the Map Skills Test the mean difference of 2.98 favored Experimental Group I. The standard error of 1.17 resulted in a critical ratio of 2.55, which was statistically significant at the .05 level but not at the .01 level.

2. Experimental Groups II and III showed highly significant differences at the .01 level when compared with the Control Group.

   a. Experimental Group II showed a mean difference of 3.86, with a standard error of 1.10, which resulted in a critical ratio of 3.51 on the Iowa: Map Reading section. The mean difference of 6.28, with a standard error of 1.00, resulted in a critical ratio of 6.28 on the Map Skills Test.

   b. Experimental Group III showed a mean difference of 7.43, with a standard error of 1.30, which resulted in a critical ratio of 5.71 on the Iowa: Map Reading section. The mean difference of 9.18, with a standard error of .99, resulted in a critical ratio of 9.27 on the Map Skills Test.

3. A comparison between Experimental Groups I and II showed dif-

ferences which favored Experimental Group II.

a. On the Iowa: Map Reading section there was a mean difference of 1.91, with a standard error of 1.13. The critical ratio of 1.69 was not statistically significant.

b. On the Map Skills Test there was a mean difference of 3.30, with a standard error of 1.17. The critical ratio of 2.82 was statistically significant at the .01 level.

4. The gains made by Experimental Group III were statistically significant at the .01 level when compared with the gains of Experimental Groups I and II.

a. When compared with Experimental Group I, there was a mean difference of 5.48, with a standard error of 1.33, which resulted in a critical ratio of 4.12 on the Iowa: Map Reading section. The mean difference of 6.20, with a standard error of 1.16, resulted in a critical ratio of 5.34 on the Map Skills Test.

b. When compared with Experimental Group II, there was a mean difference of 3.57, with a standard error of 1.30, which resulted in a critical ratio of 2.75 on the Iowa: Map Reading section. The mean difference of 2.90, with a standard error of .98, resulted in a critical ratio of 2.96 on the Map Skills Test.

II. The following conclusions may be drawn from comparisons among all the groups on the Social Studies Fact Test:

A. At the delayed testing in June:

1. There was no significant difference between the Control Group and Experimental Group I. The mean difference of .44, with a standard error of 3.15, resulted in a critical ratio of .14, which favored Experimental Group I.
2. Experimental Groups II and III showed highly significant differences in their favor when compared with the Control Group.
   a. Experimental Group II showed a mean difference of 18.66, with a standard error of 2.86, which resulted in a critical ratio of 6.52.
   b. Experimental Group III showed a mean difference of 21.86, with a standard error of 2.81, which resulted in a critical ratio of 7.78.
3. Experimental Groups II and III showed highly significant differences in their favor when compared with Experimental Group I.
   a. Experimental Group II showed a mean difference of 18.22, with a standard error of 2.89, which resulted in a critical ratio of 6.30.
   b. Experimental Group III showed a mean difference of 21.42, with a standard error of 2.85, which resulted in a critical ratio of 7.52.
4. There was no significant difference between Experimental Groups II and III. The mean difference of 3.20, with a standard error of 2.52, resulted in a critical ratio of 1.27, which favored Experimental Group III.

B. At the delayed testing in September:

1. There was no significant difference between the Control Group and Experimental Group I. The mean difference of 2.12, with a standard error of 3.05, resulted in a critical ratio of .69 which favored the Control Group.
2. Experimental Groups II and III showed highly significant differences in their favor when compared with the Control Group.
   a. Experimental Group II showed a mean difference of 9.93, with a standard error of 2.92, which resulted in a critical ratio of 3.40.
   b. Experimental Group III showed a mean difference of 13.69, with a standard error of 3.06, which resulted in a critical ratio of 4.47.
3. Experimental Groups II and III showed highly significant differences in their favor when compared with Experimental Group I.
   a. Experimental Group II showed a mean difference of 12.05, with a standard error of 3.03, which resulted in a critical ratio of 3.98.
   b. Experimental Group III showed a mean difference of 15.81, with a standard error of 3.15, which resulted in a critical ratio of 5.02.
4. There was no significant difference between Experimental Groups II and III. The mean difference of 3.76, with a standard error of 3.04, resulted in a critical ratio of 1.24 which favored Experimental Group III.

III. The following conclusions may be drawn from comparisons within the Control Group:

A. On the Map Reading section of the Iowa Tests of Basic Skills:

1. There was no significant difference between the initial mean score and the mean score at the close of the experimental teaching period.

2. There were significant differences at the .01 level between the initial mean score and the mean scores at the delayed testings in June and September.

   a. In June there was a mean gain of 5.28, with a standard error of .81, which resulted in a critical ratio of 6.52.

   b. In September there was a mean gain of 7.66, with a standard error of .96, which resulted in a critical ratio of 7.98.

3. There were significant differences at the .01 level between the mean scores at the close of the experimental teaching period and at the delayed testings in June and September.

   a. In June there was a mean gain of 5.45, with a standard error of .80, which resulted in a critical ratio of 6.81.

   b. In September there was a mean gain of 7.83, with a standard error of .95, which resulted in a critical ratio of 8.24.

4. There was a significant difference at the .05 level, but not at the .01 level, between mean scores at the delayed testing in June and the delayed testing in September, favoring the latter. The mean difference of 2.38, with a standard error of .97, resulted in a critical ratio of 2.45.

B. On the Map Skills Test:

1. There was a significant difference at the .05 level, but not at the .01 level, between the initial mean score and the mean score at the end of the experimental teaching period. The mean gain of 1.95, with a standard error of .83, resulted in a critical ratio of 2.35.
2. There were highly significant differences at the .01 level between the initial mean score and the mean scores at the delayed testings in June and September.
   a. In June there was a mean gain of 9.87, with a standard error of .89, which resulted in a critical ratio of 11.09.
   b. In September there was a mean gain of 11.60, with a standard error of .90, which resulted in a critical ratio of 12.89.
3. There were highly significant differences at the .01 level between mean scores at the close of the experimental teaching period and at the delayed testings in June and September.
   a. In June there was a mean gain of 7.92, with a standard error of .93, which resulted in a critical ratio of 8.52.
   b. In September there was a mean gain of 9.65, with a standard error of .94, which resulted in a critical ratio of 10.27.
4. There was no significant difference between mean scores at the delayed testing in June and the delayed testing in September. The mean gain of 1.73, with a standard error of 1.00, resulted in a critical ratio of 1.73.

C. On the Social Studies Fact Test:

1. There was no significant difference between the mean scores at the delayed testing in June and the delayed testing in September. The mean gain of 1.51, with a standard error of 3.03, resulted in a critical ratio of .50.

IV. The following conclusions may be drawn from comparisons within Experimental Group I.

A. On the Map Reading section of the Iowa Tests of Basic Skills:

1. There were highly significant differences at the .01 level between the initial mean score and the mean scores at the close of the experimental teaching period, the delayed testing in June, and the delayed testing in September.

a. At the close of the experimental teaching period, there was a mean gain of 6.22, with a standard error of 1.01, which resulted in a critical ratio of 6.16.

b. In June there was a mean gain of 9.06, with a standard error of 1.08, which resulted in a critical ratio of 8.39.

c. In September there was a mean gain of 9.77, with a standard error of 1.10, which resulted in a critical ratio of 8.88.

2. There were significant differences at the .01 level between the mean scores at the close of the experimental teaching period and at the delayed testings in June and September.

a. In June there was a mean gain of 2.84, with a standard error of 1.07, which resulted in a critical ratio of 2.67.

b. In September there was a mean gain of 3.55, with a standard

error of 1.09, which resulted in a critical ratio of 3.26.

3. There was no significant difference between the mean scores at the delayed testing in June and the delayed testing in September. The mean gain of .71, with a standard error of 1.15, resulted in a critical ratio of .62.

B. On the Map Skills Test:

1. There were highly significant differences at the .01 level between the initial mean score and the mean scores at the close of the experimental teaching period, the delayed testing in June, and the delayed testing in September.
   a. At the close of the experimental teaching period, there was a mean gain of 15.07, with a standard error of 1.07, which resulted in a critical ratio of 14.08.
   b. In June there was a mean gain of 15.38, with a standard error of 1.10, which resulted in a critical ratio of 13.98.
   c. In September there was a mean gain of 14.72, with a standard error of 1.20, which resulted in a critical ratio of 12.25.
2. There were no significant differences between the mean scores at the close of the experimental teaching period and at the delayed testings in June and September.
   a. In June there was a mean gain of .31, with a standard error of 1.11, which resulted in a critical ratio of .28.
   b. In September there was a mean loss of .35, with a standard error of 1.20, which resulted in a critical ratio of .29.
3. There was no significant difference between the mean scores

at the delayed testing in June and the delayed testing in September. The mean loss of .66, with a standard error of 1.23, resulted in a critical ratio of .54.

C. On the Social Studies Fact Test:

1. There was no significant difference between the mean scores at the delayed testing in June and the delayed testing in September. The mean loss of 1.05, with a standard error of 3.17, resulted in a critical ratio of .33.

V. The following conclusions may be drawn from comparisons within Experimental Group II:

A. On the Map Reading section of the Iowa Tests of Basic Skills:

1. There were highly significant differences at the .01 level between the initial mean score and the mean scores at the close of the experimental teaching period, the delayed testing in June, and the delayed testing in September.

a. At the close of the experimental teaching period, there was a mean gain of 11.13, with a standard error of .91, which resulted in a critical ratio of 12.23.

b. In June there was a mean gain of 10.25, with a standard error of 1.00, which resulted in a critical ratio of 10.25.

c. In September there was a mean gain of 11.78, with a standard error of 1.04, which resulted in a critical ratio of 11.33.

2. There were no significant differences between the mean scores at the close of the experimental teaching period and at the

delayed testings in June and September.

a. In June there was a mean loss of .88, with a standard error of .91, which resulted in a critical ratio of .97.

b. In September there was a mean gain of .65, with a standard error of .97, which resulted in a critical ratio of .67.

3. There was no significant difference between mean scores at the delayed testing in June and the delayed testing in September. The mean gain of 1.53, with a standard error of 1.05, resulted in a critical ratio of 1.46.

B. On the Map Skills Test:

1. There were highly significant differences at the .01 level between the initial mean score and the mean scores at the close of the experimental teaching period, the delayed testing in June, and the delayed testing in September.

a. At the close of the experimental teaching period, there was a mean gain of 19.90, with a standard error of .81, which resulted in a critical ratio of 24.57.

b. In June there was a mean gain of 18.12, with a standard error of .87, which resulted in a critical ratio of 20.83.

c. In September there was a mean gain of 18.04, with a standard error of .93, which resulted in a critical ratio of 19.40.

2. There were significant differences at the .05 level, but not at the .01 level, between mean scores at the close of the experimental teaching period and at the delayed testings in June and September.

a. In June there was a mean loss of 1.78, with a standard error of .83, which resulted in a critical ratio of 2.14.

b. In September there was a mean loss of 1.86, with a standard error of .89, which resulted in a critical ratio of 2.09.

3. There was no significant difference between the mean scores at the delayed testing in June and the delayed testing in September. The mean loss of .08, with a standard error of .95, resulted in a critical ratio of .08.

C. On the Social Studies Fact Test:

1. There was a significant difference at the .01 level between the mean scores at the delayed testing in June and the delayed testing in September. The mean loss of 7.22, with a standard error of 2.74, resulted in a critical ratio of 2.64.

VI. The following conclusions may be drawn from comparisons within Experimental Group III.

A. On the Map Reading section of the Iowa Tests of Basic Skills:

1. There were highly significant differences at the .01 level between the initial mean score and the mean scores at the close of the experimental teaching period, the delayed testing in June, and the delayed testing in September.

a. At the close of the experimental teaching period, there was a mean gain of 14.92, with a standard error of 1.19, which resulted in a critical ratio of 12.54.

b. In June there was a mean gain of 15.43, with a standard error of 1.30, which resulted in a critical ratio of 11.87.

c. In September there was a mean gain of 15.47, with a standard error of 1.27, which resulted in a critical ratio of 12.18.

2. There were no significant differences between the mean scores at the close of the experimental teaching period and at the delayed testings in June and September.

   a. In June there was a mean gain of .51, with a standard error of 1.43, which resulted in a critical ratio of .36.

   b. In September there was a mean gain of .55, with a standard error of 1.40, which resulted in a critical ratio of .39.

3. There was no significant difference between mean scores at the delayed testing in June and the delayed testing in September. The mean gain of .04, with a standard error of 1.50, resulted in a critical ratio of .03.

B. On the Map Skills Test:

1. There were highly significant differences at the .01 level between the initial mean score and the mean scores at the close of the experimental teaching period, the delayed testing in June, and the delayed testing in September.

   a. At the close of the experimental teaching period, there was a mean gain of 21.27, with a standard error of .83, which resulted in a critical ratio of 25.63.

   b. In June there was a mean gain of 21.43, with a standard error of .90, which resulted in a critical ratio of 23.81.

   c. In September there was a mean gain of 20.94, with a stand-

ard error of .93, which resulted in a critical ratio of 22.52.

2. There were no significant differences between mean scores at the close of the experimental teaching period and at the delayed testings in June and September.
   a. In June there was a mean gain of .16, with a standard error of .84, which resulted in a critical ratio of .19.
   b. In September there was a mean loss of .33, with a standard error of .87, which resulted in a critical ratio of .38.
3. There was no significant difference between the mean scores at the delayed testing in June and the delayed testing in September. The mean loss of .49, with a standard error of .94, resulted in a critical ratio of .52.

C. On the Social Studies Fact Test:

1. There was a significant difference at the .05 level, but not at the .01 level, between the mean scores at the delayed testing in June and the delayed testing in September. The mean loss of 6.66, with a standard error of 2.84, resulted in a critical ratio of 2.35.

VII. The following general conclusions may be drawn from all of the comparisons made:

A. All experimental groups made gains in map skills which were statistically superior to the gains of the Control Group. Experimental Group III, which comprised children working in teams of three, showed the greatest gains, followed by Experimental

Group II, with children working in pairs, and Experimental Group I, with children working alone.

B. It would appear that children can learn, retain, and implement the basic map skills of the fourth grade social studies program in a concentrated, intensive program of instruction.

C. Children who had worked on the map skills lessons in pairs and teams of three showed gains in social studies factual data which were statistically superior to the gains of the children who had worked alone and the Control Group.

D. There was no significant difference between the success of boys and girls in either map skills knowledge or in social studies factual data.

E. Intelligence does not appear to be a very important factor in determining the effect of the program on retention.

F. The evaluation of the lessons and procedures by teachers and children indicated general interest and acceptance.

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BIBLIOGRAPHY

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APPENDIX A

Map Skills Test

1. Which of the cardinal directions is directly opposite south?

   a. North
   b. East
   c. West
   d. None of these

2. Which two of the following are not cardinal directions?

   a. North
   b. Northeast
   c. South
   d. Southwest

3. If you were facing north, which cardinal direction would be to the right?

   a. South
   b. East
   c. West
   d. None of these

4. Which direction is halfway between south and west?

   a. Northeast
   b. Southeast
   c. Southwest
   d. Northwest

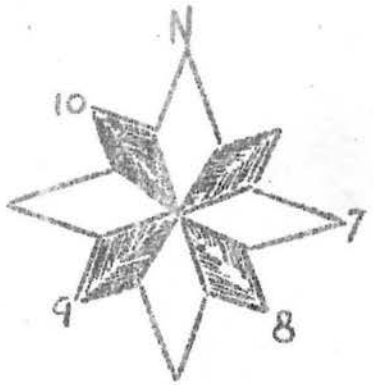
5. In our part of the world, in which direction would your shadow point at noon?

   a. North
   b. East
   c. South
   d. West

6. Which of these tell what the earth is made up of?

   a. Land and water
   b. Land and air
   c. Water and air
   d. Land, water and air

Use the following diagram to answer questions 7-8-9-10.
Be sure to notice that north is at the top.



7. What direction would be at 7?

a. North
b. Northwest
c. East
d. Southeast

8. What direction would be at 8?

a. East
b. Southeast
c. West
d. Northwest

9. What direction would be at 9?

a. East
b. Northeast
c. West
d. Southwest

10. What direction would be at 10?

a. West
b. Northwest
c. East
d. Southeast

---

11. A body of water surrounded by land is called---

a. a peninsula
b. an island
c. a lake
d. a gulf

12. The earth rotates on its axis---

a. Once every 12 hours
b. Once every 24 hours
c. Once every 48 hours
d. Once a month

13. The earth is shaped like a---

a. Oval
b. Square
c. Sphere
d. None of these

14. The imaginary line which is halfway between the North Pole and the South Pole is called the---

a. Equator
b. Tropic of Cancer
c. Tropic of Capricorn
d. Earth's axis

15. When the earth is divided into hemispheres, we find that we live in the---

a. Northern Hemisphere and Eastern Hemisphere
b. Northern Hemisphere and Western Hemisphere
c. Southern Hemisphere and Eastern Hemisphere
d. Southern Hemisphere and Western Hemisphere

16. A peninsula is---

a. a large body of water
b. land surrounded by water on two sides
c. land surrounded by water on three sides
d. land completely surrounded by water

17. How many continents are there?

a. three
b. five
c. seven
d. nine

18. The largest continent on the earth is---

a. North America
b. Europe
c. Africa
d. Asia

19. The smallest continent on the earth is---

a. Australia
b. Antarctica
c. South America
d. North America

20. A strait is---

a. a large area of land with water on two sides
b. a narrow body of water that connects two larger bodies of water
c. a large part of the ocean that goes into the lan
d. a body of water surrounded by land

21. Which continent do you live on?

a. Asia
b. Africa
c. Europe
d. North America

22. When you live in Massachusetts, what is the nearest ocean you could swim in?

a. Atlantic Ocean
b. Pacific Ocean
c. Indian Ocean
d. Arctic Ocean

23. The imaginary line between the Arctic Circle and the equator is the---

a. Tropic of Cancer
b. Tropic of Capricorn
c. Antarctic Circle
d. None of these

24. The imaginary line between the Tropic of Cancer and the Tropic of Capricorn is the---

a. Arctic Circle
b. Antarctic Circle
c. Equator
d. None of these

25. In what direction is the equator from the South Pole?

a. North
b. East
c. South
d. West

26. On a map, symbols are used to tell---

a. a distance
b. a picture of what is really there
c. time
d. a story in words

27. On a map, water is usually shown in what color?

a. yellow
b. blue
c. red
d. green

28. 

This line is one inch long. If you saw this on a map scale, you would know that one inch was supposed to represent---

a. 100 inches
b. 100 feet
c. 100 yards
d. 100 miles

29. 

Which continent is this a map of?

a. North America
b. South America
c. Asia
d. Africa

30. The sun seems to rise in the---

a. North
b. East
c. South
d. West

31. When you live in Massachusetts what time zone are you in?

a. Pacific Time Zone
b. Eastern Time Zone
c. Central Time Zone
d. Mountain Time Zone

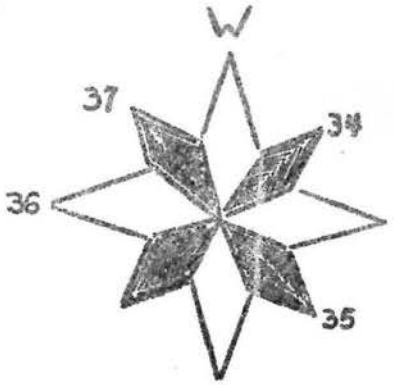
32. What is formed by mud dropped by a river at its mouth?

a. isthmus
b. peninsula
c. delta
d. bay

33. The part of the United States which sees the sun at the earliest hours is called the---

a. Pacific Time Zone
b. Mountain Time Zone
c. Central Time Zone
d. Eastern Time Zone

Use the following diagram to answer questions 34-35-36-37.
Be sure to notice that <u>west</u> is at the top.



34. What direction would be at 34?

a. east
b. northwest
c. southeast
d. south

35. What direction would be at 35?

a. north
b. southwest
c. northeast
d. east

36. What direction would be at 36?

a. east
b. southeast
c. south
d. northwest

37. What direction would be at 37?

a. north
b. northeast
c. south
d. southwest

The picture map below shows a classroom in a school. The desks of the pupils are arranged in study groups. The groups are called A, B, C, D, E and F. The signs for the other objects in the classroom are shown in the key below the map. By using this picture map, answer questions 38 through 42.

hola

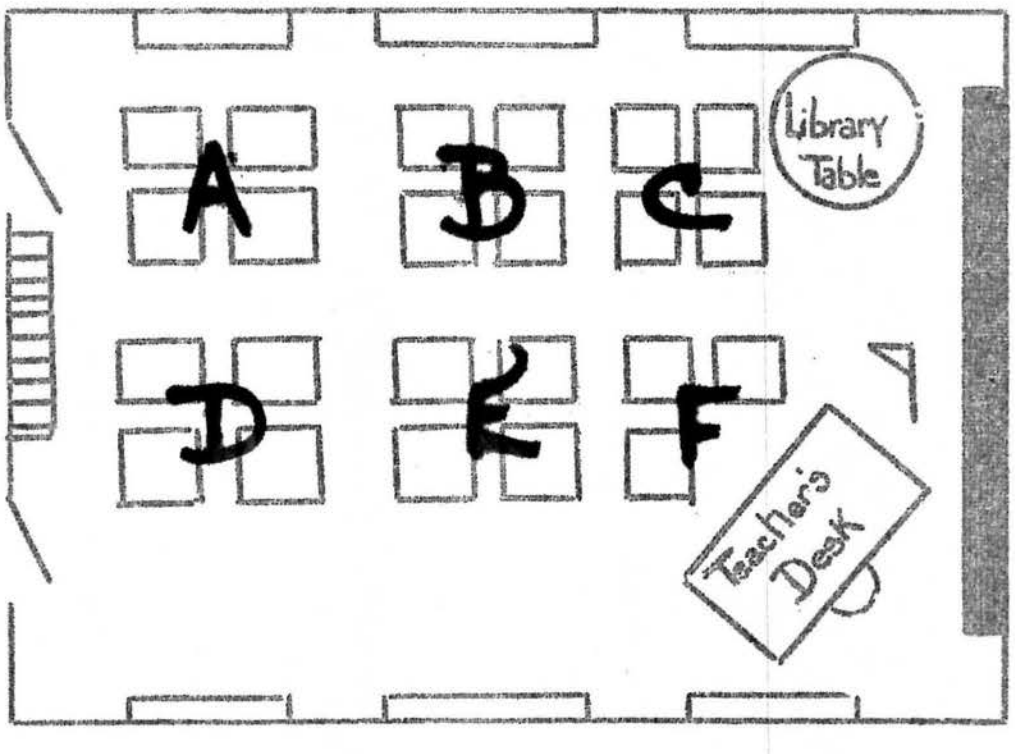
lackboard

ndow

or

okcase

Flag



38. Which group is nearest the teacher's desk?

a. Group B
b. Group C
c. Group E
d. Group F

39. The pupils enter the room from which direction?

a. North
b. East
c. South
d. West

40. Which group is east of group B?

a. Group A
b. Group C
c. Group E
d. Group F

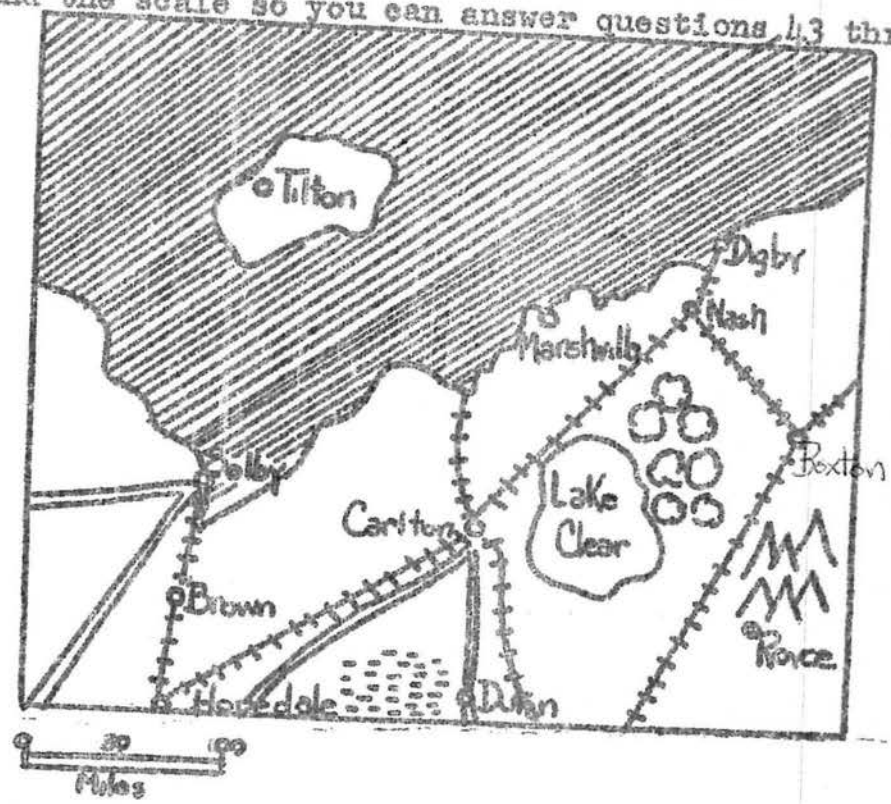
41. The two groups nearest to the bookcase are.....

a. Group A and Group B
b. Group A and Group D
c. Group D and Group E
d. Group B and Group E

42. The blackboard is on which wall?

a. North
b. East
c. South
d. West

This is a map of an imaginary area of land which has many cities, mountains, highways, railroads and other things which are shown by symbols at the bottom of the map. Study the map legend and the scale so you can answer questions 43 through 49.



Symbol Legend

Mountains

Water

Forest

Desert

Highway

Railroad

City

regular coastline

irregular coastline

43. Which city is nearest the forest region?

a. Boxton
b. Brown
c. Carlton
d. Dunn

44. About how far is it from Nash to Boxton?

a. 50 miles
b. 100 miles
c. 150 miles
d. 200 miles

45. The city of Tilton is on---

a. an isthmus
b. a bay
c. a delta
d. an island

46. What city is farthest north from Hopedale in railway distance?

a. Carlton
b. Nash
c. Digby
d. Dunn

47. What city is closest to a desert region?

a. Solby
b. Dunn
c. Royce
d. Brown

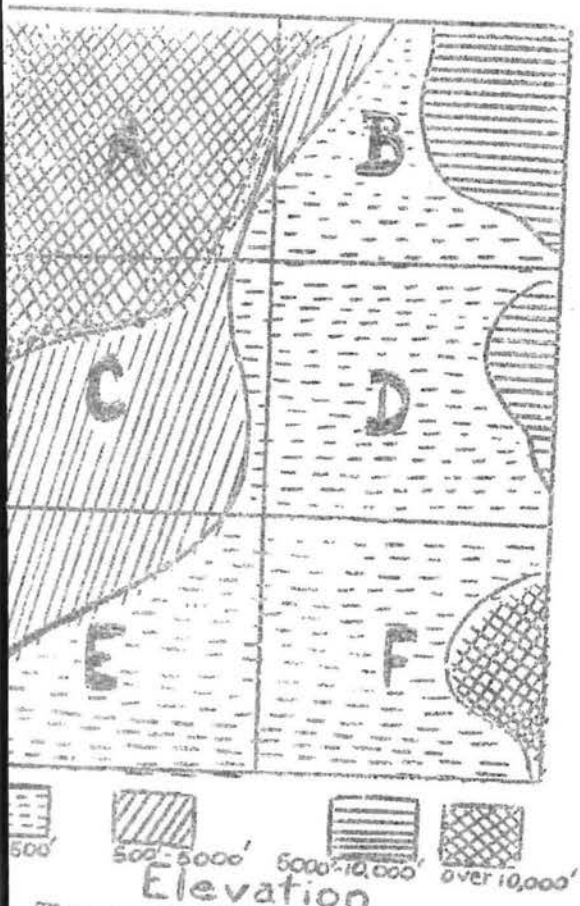
48. The city on an irregular coastline is---

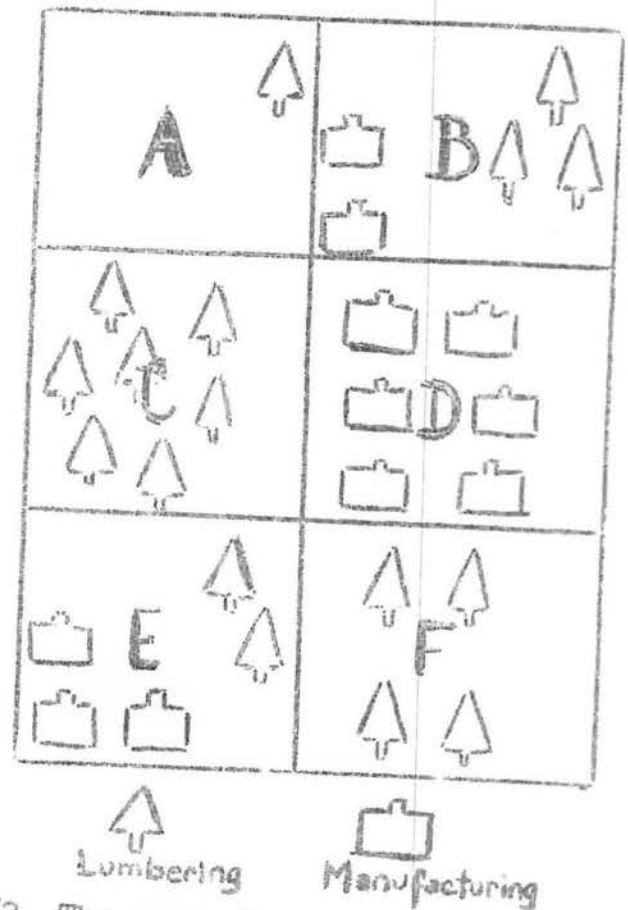
a. Solby
b. Marshville
c. Nash
d. Digby

49. At what city would you stop by railroad to reach Lake Clear?

a. Dunn
b. Royce
c. Carlton
d. Marshville

The two maps on this page show the same small section of a state. The first map shows you how high the land is in the area. The second map shows you where lumbering and manufacturing is carried on. Answer questions 50 through 53 by using the following maps.





The area that produces the most lumber is---

a. B
b. C
c. E
d. F

52. The area that has the most manufacturing is---

a. B
b. C
c. D
d. E

In which area is most of the land over 10,000 feet high?

a. A
b. C
c. D
d. F

53. Most of the land at C is---

a. At or near sea level
b. 500 - 5000 feet high
c. 5000 - 10,000 feet high
d. over 10,000 feet high

APPENDIX B

APPENDIX C

TO THE PUPIL

The lessons which you are about to begin will help you to understand more about the way boys and girls in other parts of the world live. You will study about people in distant places by learning of their homes, their land, their climate and the many other important things which will give you a real picture of their way of life.

This exciting information will come from maps. As you begin, maps may be new and strange but you will quickly find out that reading a map is somewhat like reading a book. A map is a picture or a drawing that tells a story. In order to tell a story, it must have a language. The map language you are about to learn will allow you to see many things in a small space.

On some maps you will be able to find your home, the school you attend, the place where your father works, the shopping district, the beach, the railroad and almost anything else in your neighborhood. On other maps you will be able to find your country and the countries of children who live far away from you. Some maps may tell you about the kinds of animals that live in certain places. Other maps may show you the products of the country you are studying. You shall learn these things and so much more---and all because you shall soon know how to read a map.

Lesson I

DIRECTIONS--VOCABULARY

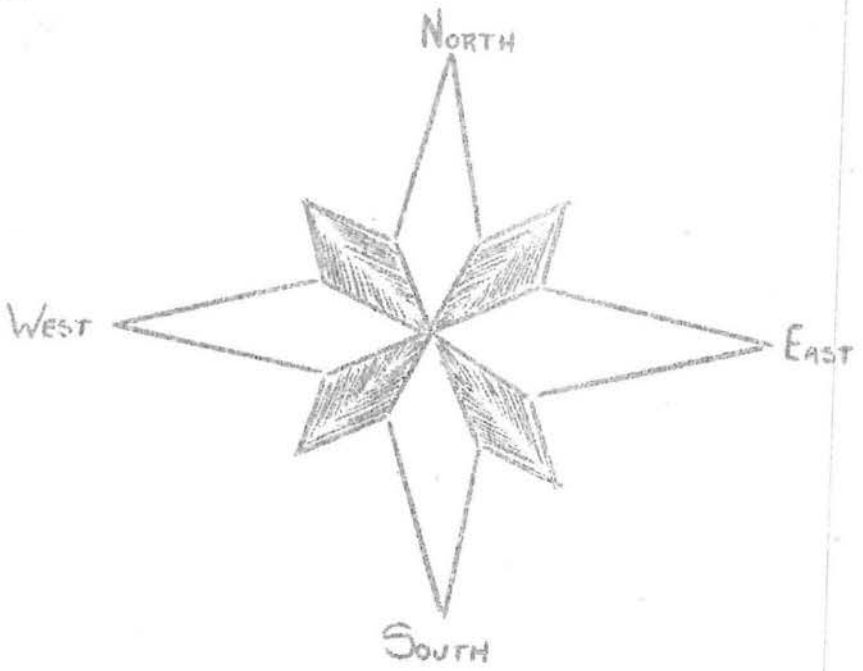
Cardinal Directions are the main directions. These are north, east, south, and west.

North is always toward the North Pole. At noon in our part of the earth, your shadow always points to the north.

South is always toward the South Pole. It is always directly opposite north.

East is always to the right of north. When you face east, west is directly behind you.

West is opposite east. It is the direction which is to the left of north.



Use the diagram on page one to answer the following questions---

1. What direction is always toward the South Pole? _____
2. What direction is always toward the left of north? _____
3. If you were facing east, what direction would be directly behind you? _____
4. What direction is to the right of north? _____
5. What direction is opposite south? _____
6. What direction is always toward the North Pole? _____
7. What direction is opposite west? _____
8. If you were in the center facing north, what direction would be directly behind you? _____

Remember that north, east, south and west are the main directions. They are called cardinal directions.

Write the names of the cardinal directions.

_____

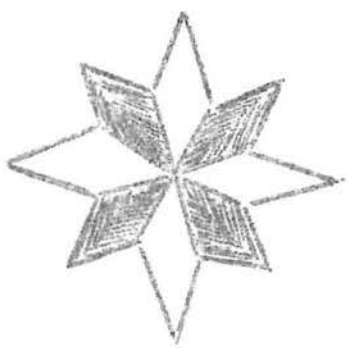
_____

_____

_____

On the diagram below, north has been placed at the top. Place the names of the other cardinal directions at the correct points.

North



_____ _____

_____

Sometimes we talk about the northern part of the country. Northern is a word that means toward the north.

If I am going toward the North Pole, I am going in a northern direction.

We may talk about the warm weather of our southern states. Southern means going toward the south.

Bill lives in the southern section of our state. From here we must go toward the south to visit Bill's home.

Eastern and Western are also used when we talk about going toward the east or toward the west.

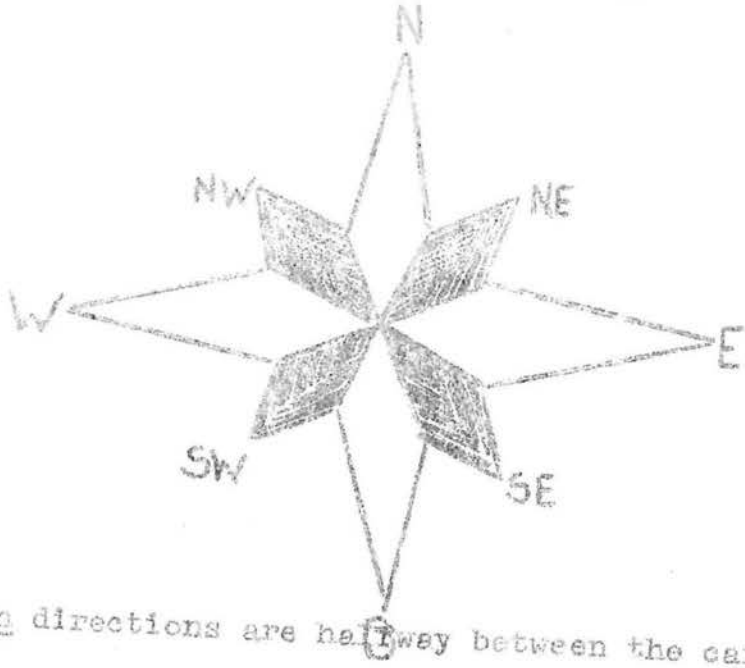
If I walk to the east I am walking toward the eastern section.

If a train takes its passengers west, it is taking them to a western area.

Northern, eastern, southern and western are used when we are talking about a place toward the north, east, south or west. Can you fill in the right word?

1. John must travel to the north. He is therefore going to a _____ part of our country.
2. Mary lives in the southern part of our country. Her home is toward the _____ Pole.
3. Bill spent his vacation in the West. He had to travel toward the _____ part of our country.
4. The eastern part of our country is directly opposite the _____ part of our country.

In-between Directions



In-between directions are halfway between the cardinal - or main - directions.

Northeast is halfway between north and east.

Southeast is halfway between south and east.

Southwest is halfway between south and west.

Northwest is halfway between north and west.

Are the following directions cardinal directions or in-between directions? Write them in the correct column.

north
southwest
northeast
west
northwest
east
south
southeast

Cardinal Directions	In-between Directions

Check yourself ---

Which in-between direction is between north and east? _____

Which in-between direction is between south and west? _____

Which in-between direction is between north and west? _____

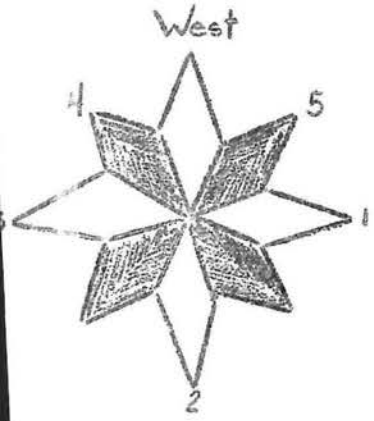
Which in-between direction is between south and east? _____

Just as we said northern, eastern, southern and western, we may also use the words northeastern, northwestern, southeastern or southwestern.

1. If we go toward the southeast, we are traveling in a _____ direction.
2. The direction toward the northwest is a _____ direction
3. To reach a state in the southwestern part of our country we must travel to the _____.
4. Northeastern states are toward the _____.

You have practiced finding directions with north at the top. If you remember the rules for locating directions you should be able to complete the following diagrams.

Notice the first diagram. You will see that west is at the top.



1. _____
2. _____
3. _____
4. _____
5. _____

What cardinal direction is directly opposite west?

If you said east, you are correct.

Mark number 2 on the blank space east.

What cardinal direction would be at number 1?

The answer is north because west is always to the left of north.

Write beside number 1 north.

Number 3 is, of course, south because south is directly opposite north and also west is always to the right of south.

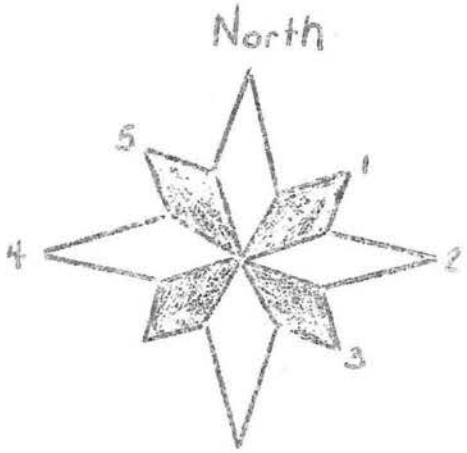
Number 4 is an in-between direction. It is between south and west. The direction at number 4 is southwest.

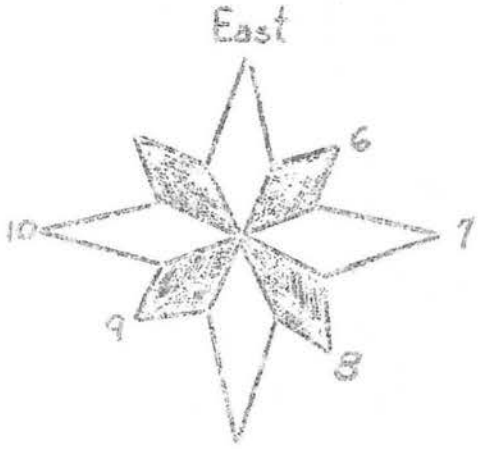
What direction would be at number 5?

_____

Activity Exercise

Cardinal and In-Between Directions





Identify each point and fill in the blanks with the words north, northeast, east, southeast, south, southwest, west, or northwest. Notice that the direction on the top is different on both figures.

1. _____ 6. _____

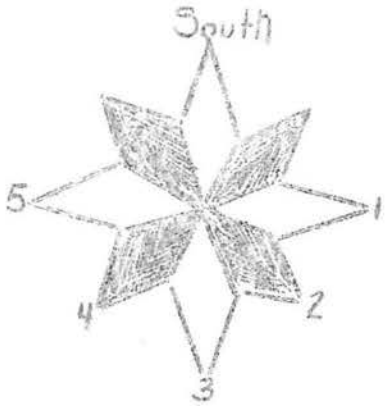
2. _____ 7. _____

3. _____ 8. _____

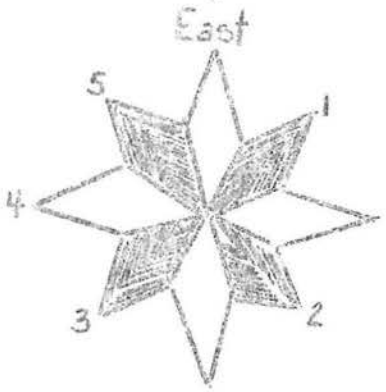
4. _____ 9. _____

5. _____ 10. _____

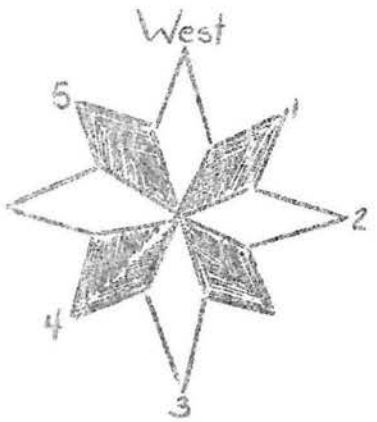
Now to the practice exercises below. Be sure to notice the direction at the top of the diagram. Fill in the correct blank beside the number that will identify the missing direction.



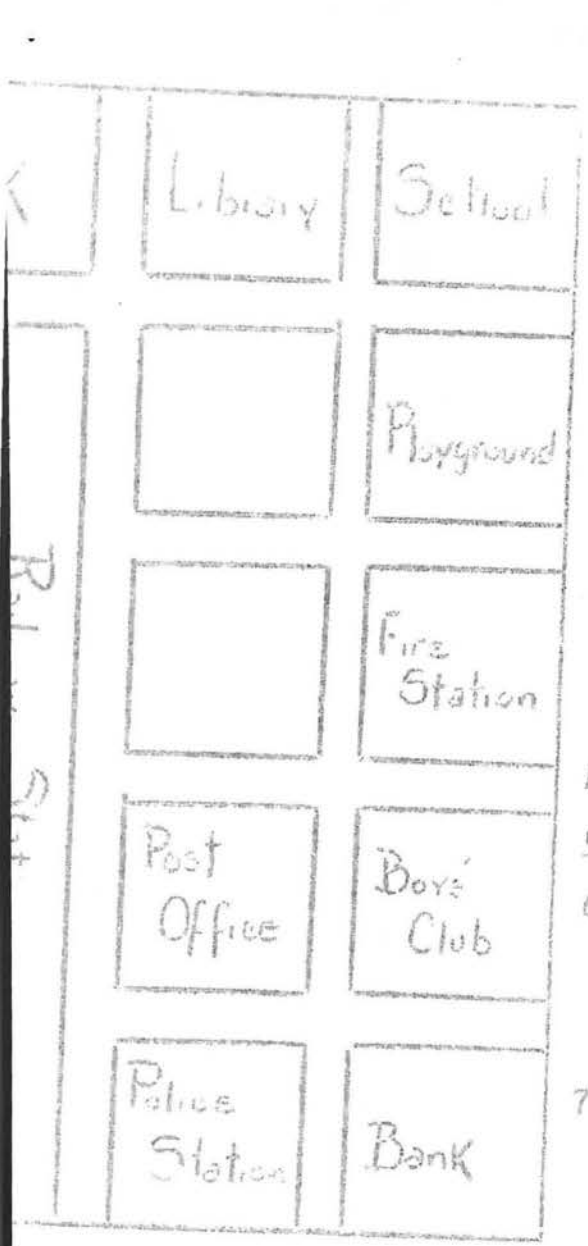
1. _____
2. _____
3. _____
4. _____
5. _____

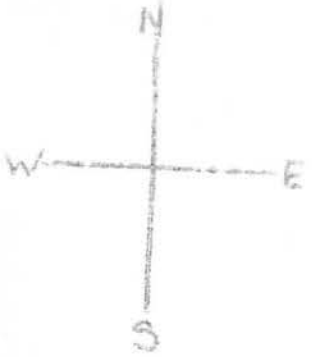


1. _____
2. _____
3. _____
4. _____
5. _____



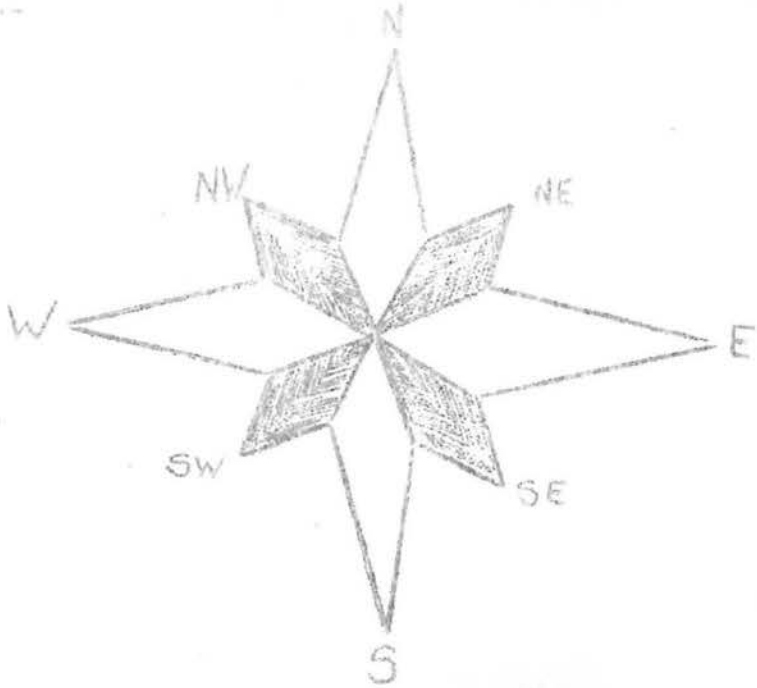
1. _____
2. _____
3. _____
4. _____
5. _____





1. What is north of the Railway Station? _____
2. What is east of the Police Station? _____
3. Which is closer to the School - - the Library or the Fire Station? _____
4. What is west of the School? _____
5. What is south of the Library? _____
6. If I walk from the Post Office to the Library in what direction am I traveling? _____
7. If I walk from the Bank to the Railway Station in what direction am I going? _____

Review---



1. When you face west, directly behind you is _____.
2. When you face north, _____ is to your right.
3. When you face south, to your left is _____.
4. Point to the north-----directly behind you is _____.
5. When you point to the east, at your left is _____.
6. When you point to the north, at your left is _____.
7. At noon your shadow points to the _____.
8. The direction toward the North Pole is _____.
9. The direction between north and west is _____.
10. The direction between south and east is _____.
11. The direction between north and east is _____.
12. The direction between south and west is _____.
13. The direction toward the South Pole is _____.
14. A northern direction is toward the _____ Pole.
15. To reach the South Pole, I must take a _____ route.

Blackboard

Bookcase

Door

Flag

Pupil's desks

Table

Teacher's desk

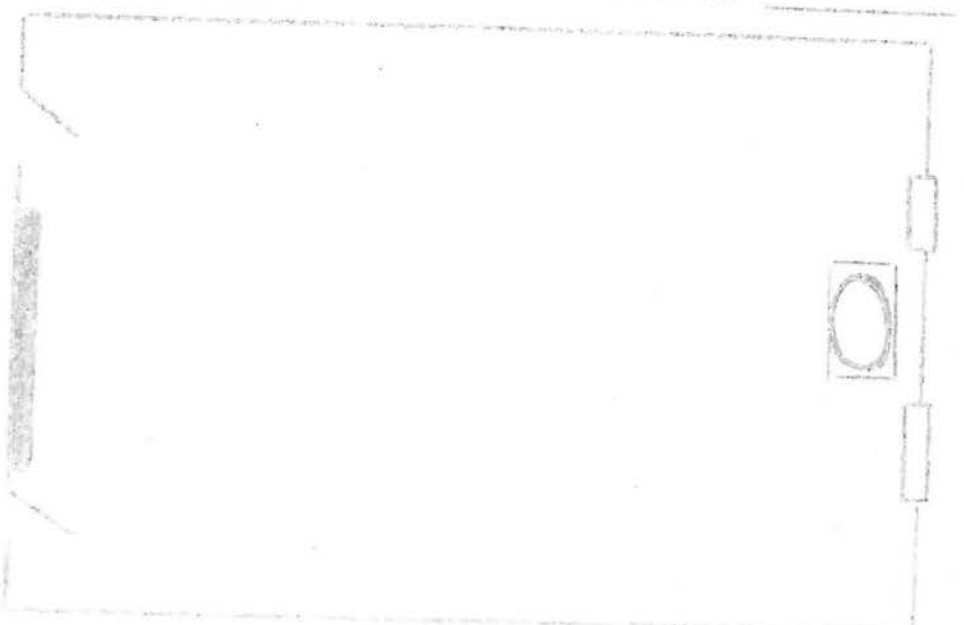
Television

Window

Wastebasket

Pretend that you are fixing a new classroom. You must place all of the furniture in the right place and must arrange the new equipment according to a plan.

1. Place the teacher's desk so it will be in the southern part.
2. Place the waste basket east of the teacher's desk.
3. Place the bookcase on the northern wall.
4. Arrange the pupil's desk north of the teacher's desk.
5. Put the flag west of the teacher's desk.
6. Put the reading table north of the flag.
7. On which wall are the windows? _____
8. On which wall is the blackboard? _____
9. On which wall are the doors? _____
10. In what part of the room is the television? _____



Up and Down

As we learn about the Earth and its directions, we must be careful to use up and down correctly. Up always means away from the center of the Earth. Down always means toward the center of Earth.

Do not use "up" and "down" when you mean north and south. Up means away from the land, toward the sky which is away from the center of the earth.

Down means toward the ground, away from the sky which is toward the center of the earth.

We go up to the top floor.

We go down to the cellar.

The plane flies up in the sky.

The ship sank down to the bottom of the sea.

The birds are up in their nests.

The stars are up in the sky.

The ball rolled down the hill.

The rocket ship was sent up into space.

We go up on a ski-lift.

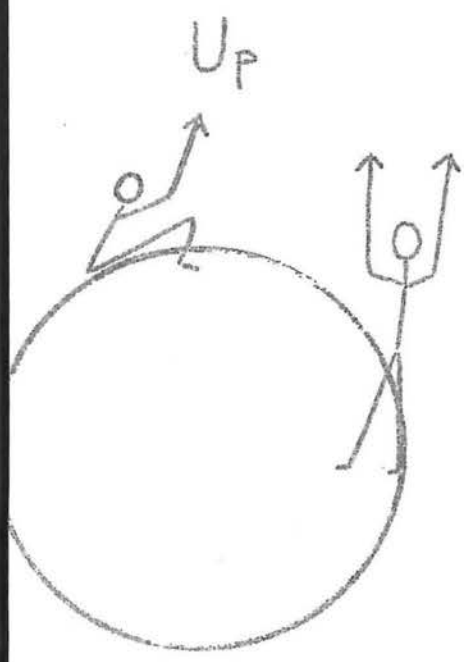
We see logs float down the river.

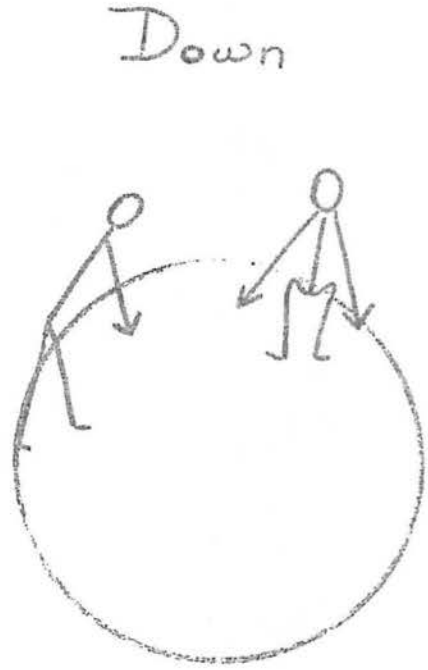
The stone dropped down to the bottom of the well.

We must be very careful when we say up and down. Remember that up only means away from the center of the earth and down only means toward the center of the earth.

Up or down?

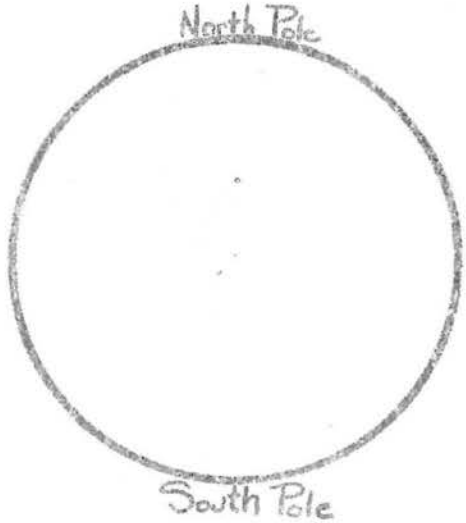
1. The boy fell _____ the stairs.
2. The balloon flew _____ in the air.
3. The elevator went _____ to the top floor.
4. The man climbed _____ to the peak of the mountain.
5. The animal dug a hole _____ into the ground.
6. We climbed _____ the tree to get the apples.
7. The ball was hit _____ into the stands.
8. The coal miner went _____ to the bottom of the shaft.
9. The submarine stayed _____ below the surface for 48 hours.
10. The rain came _____ from the clouds.



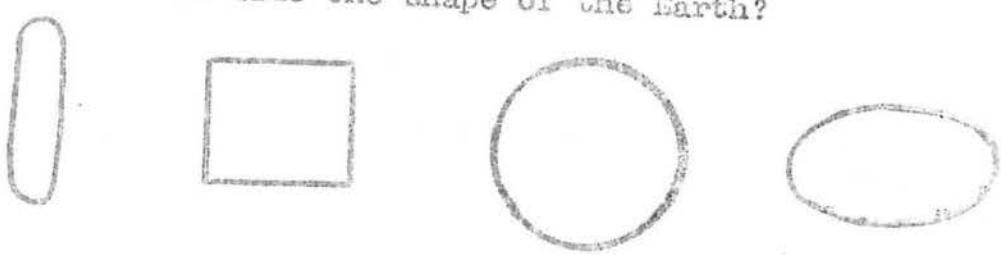


The Earth is round like a ball. The shape of the Earth is called a sphere. It turns around like a ball. We call this turning rotating. The Earth rotates on an imaginary or make believe line which is the Earth's axis. The Earth rotates on its axis once every 24 hours.

The Earth's axis comes out at two places. We call these the poles. There is a North Pole and a South Pole. The poles help us to follow directions, toward the north and toward the south.



Which of these look like the shape of the Earth?



What do we call the turning of the Earth? _____

The shape of the Earth is called a _____.

The Earth rotates on its _____.

The Earth rotates once every _____ hours.

There are _____ hours in a day.

The Earth's axis comes out at the _____ Pole and the _____ Pole.

The shape of the Earth is called a "sphere".

The globe in your classroom shows the Earth as a sphere. How many things can you think of which look like a sphere?

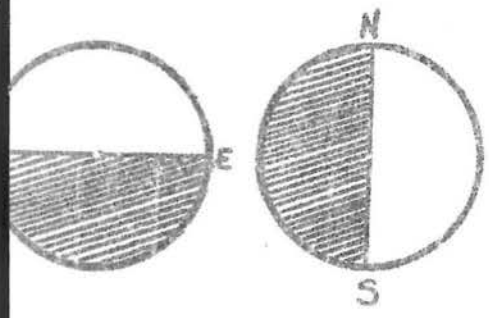
_____

_____

_____

_____

_____



An imaginary line around the middle of the Earth would divide the Earth into two halves. We would then heve hemispheres. (Hemi means half, so a hemisphere is half of a sphere)

Each half is a hemisphere.

The shape of the Earth is called a sphere.

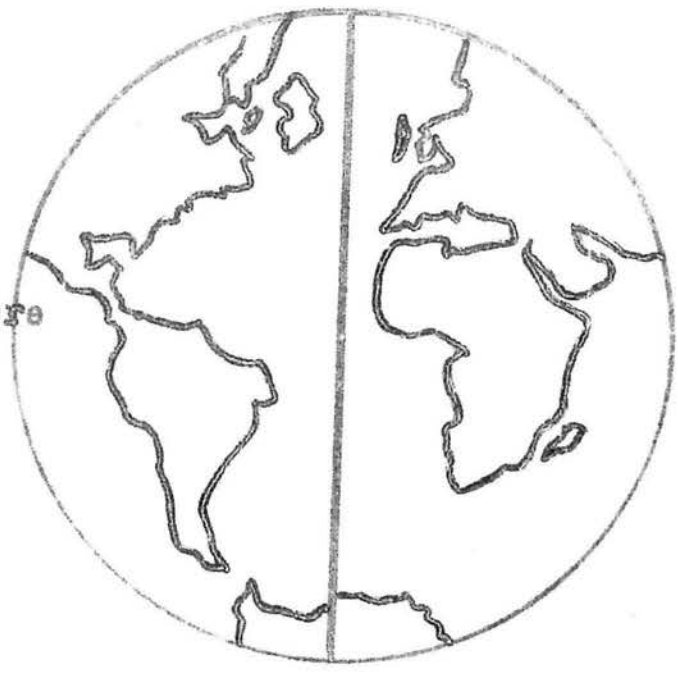
When the Earth is divided into halves, we call each half a _____ sphere.

The Earth may be divided into the Northern Hemisphere and the Southern Hemisphere when it is divided from east to west.

The Earth may be divided into the Eastern Hemisphere and the Western Hemisphere when it is divided from north to south.

Northern Hemisphere

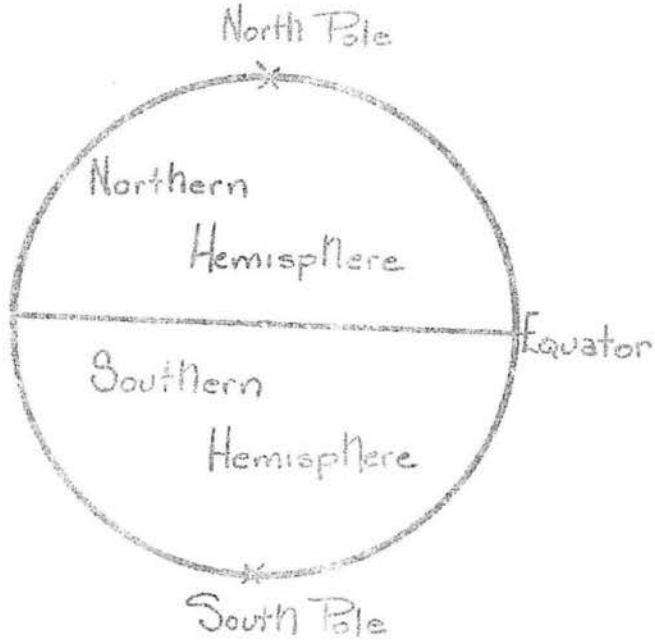
Southern Hemisphere



Western Hemisphere

Eastern Hemisphere

The imaginary line around the center of the earth is called the equator. The equator divides the Earth from east to west and makes the Northern Hemisphere and the Southern Hemisphere.



The equator is halfway between the North Pole and the South Pole.

The equator divides the Earth into the _____ hemisphere and the _____ hemisphere.

The half of the earth between the equator and the North Pole is the _____ hemisphere.

The half of the earth between the equator and the South Pole is the _____ hemisphere.

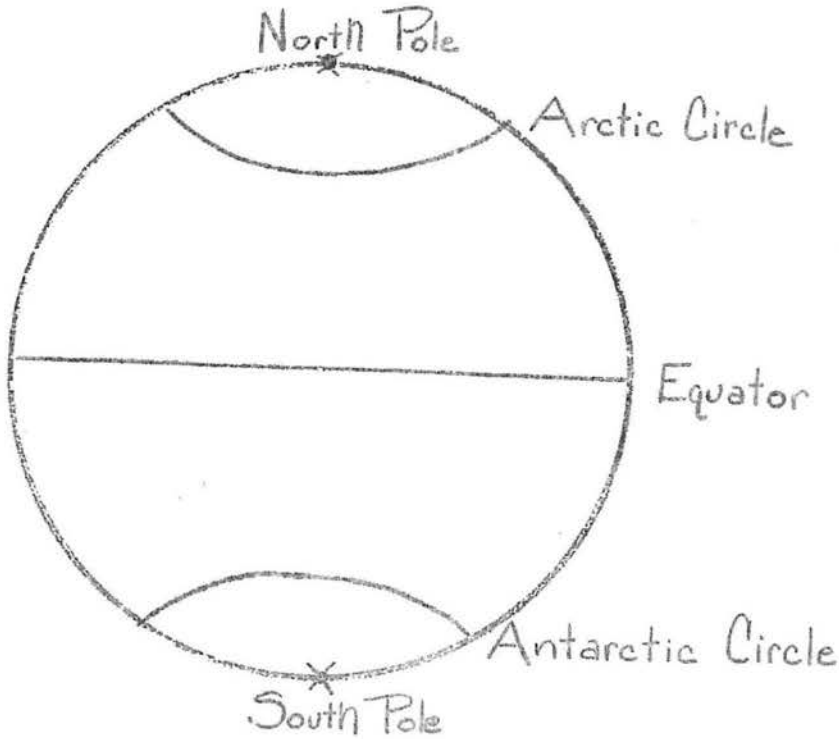
A make-believe line from the North Pole to the South Pole would divide the earth into the _____ hemisphere and the _____ hemisphere.

Look at the globe in your classroom. What hemisphere do you live in?

On the drawing of the globe below draw the imaginary line which goes around the middle of the earth. Remember that this is not a real line, but a make-believe one. We called this line the equator.

There are other imaginary lines on the globe which help us to find places. There is an imaginary line at the top of the globe. The imaginary line closest to the North Pole is called Arctic Circle.

The imaginary line closest to the South Pole is called the Antarctic Circle.



. The imaginary line which goes around the center of the earth from east to west is called the _____.

. The imaginary line which is closest to the North Pole is called the _____.

. The imaginary line which is closest to the South Pole is called the _____.

. The Arctic Circle is in the _____ hemisphere.

. The Antarctic Circle is in the _____ hemisphere.

would divide the earth into the Eastern Hemisphere and the Western Hemisphere.

Do you live in the eastern or the western hemisphere?

_____

We live in the Northern Hemisphere and the Western Hemisphere.

Look on your flat map.

Which has more land - the northern or southern hemisphere?

_____

Which has more water - the northern or southern hemisphere?

_____

Which has more land - the eastern or western hemisphere?

_____

Which has more water - the eastern or western hemisphere?

_____

Write down some questions about the earth that you think other children can now answer. Be sure that you know the answers to your questions.

There are other important imaginary lines that go around the earth. We have learned the position of the:

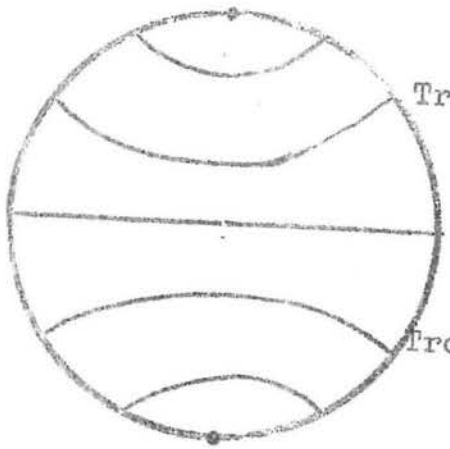
Equator

Arctic Circle

Antarctic Circle

Now we are going to learn of two more imaginary lines. They are the Tropic of Cancer and the Tropic of Capricorn. The imaginary line between the Arctic Circle and the Equator is called the Tropic of Cancer.

The imaginary line between the Antarctic Circle and the Equator is called the Tropic of Capricorn.



Which imaginary line is between the Tropic of Cancer and the Tropic of Capricorn? _____

Which imaginary line is north of the Tropic of Cancer? _____

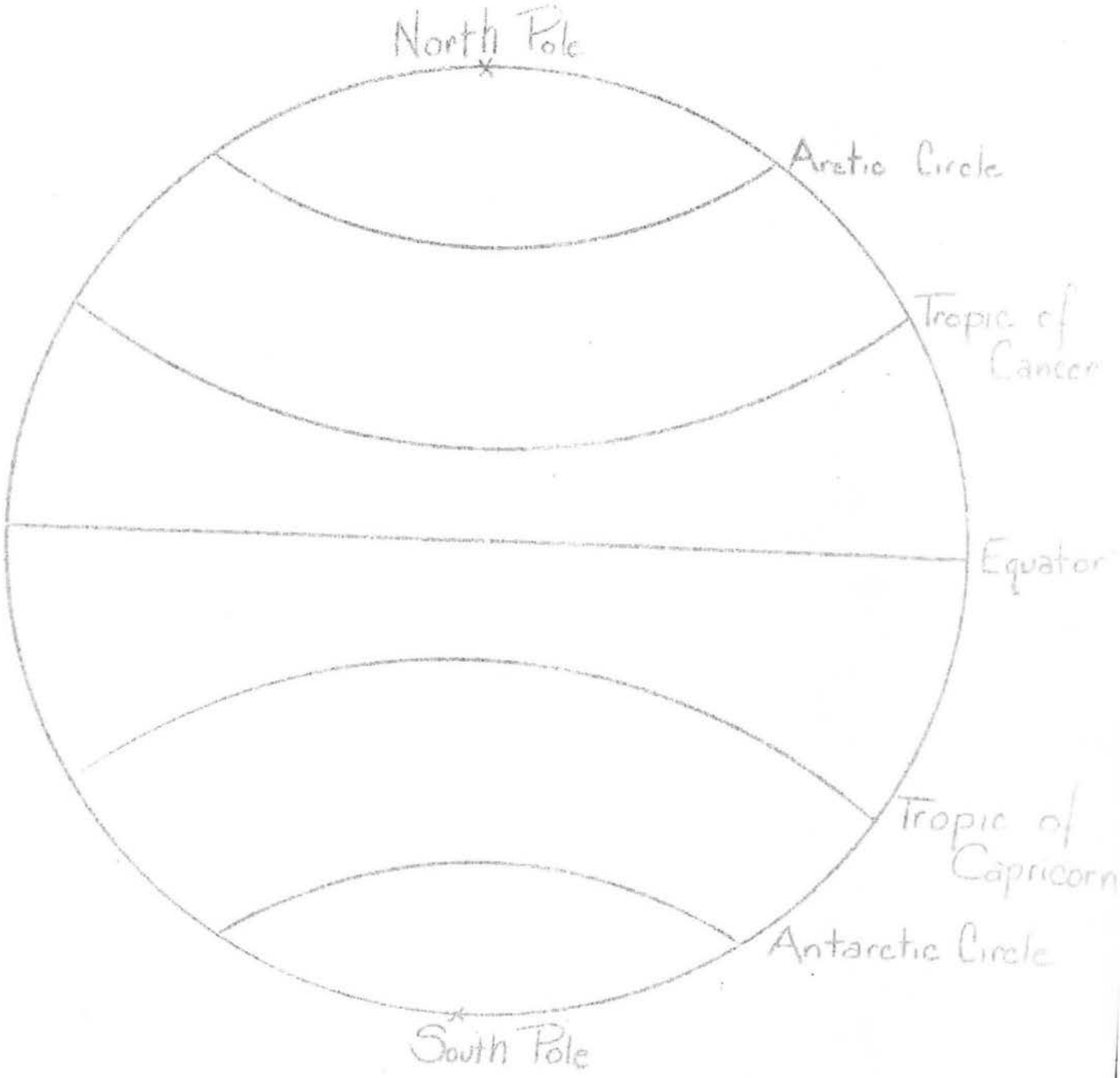
Which imaginary line is south of the Tropic of Capricorn? _____

Which imaginary line is south of the Tropic of Cancer? _____

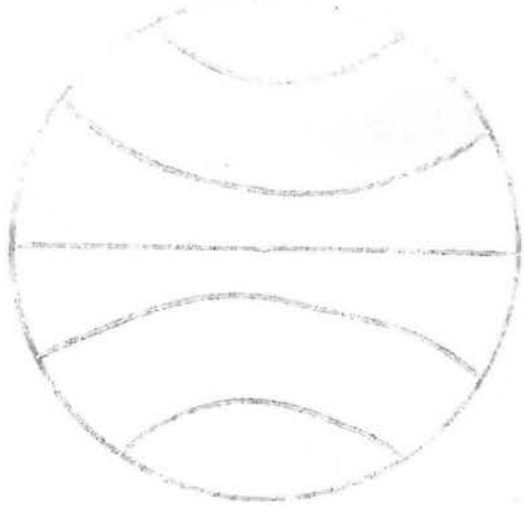
Which imaginary line is north of the Tropic of Capricorn? _____

Since our world is a great round ball, it would not be possible to draw these lines on the huge earth. The lines are important, however, and have real names.

Review them---



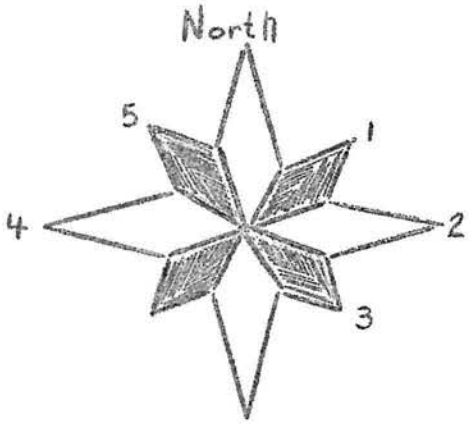
Artistic exercise

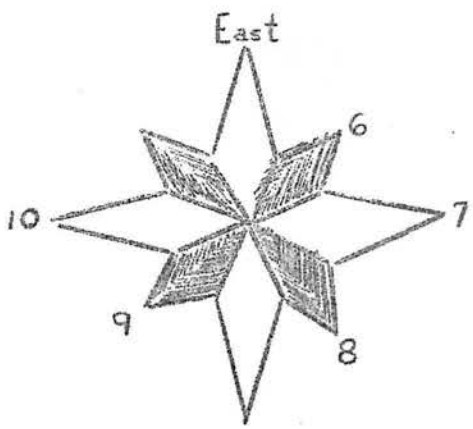


1. Find the equator. It is halfway between the _____ and the _____.
2. The Tropic of Cancer is between the _____ and the _____.
3. The Arctic Circle is between the _____ and the _____.
4. The Antarctic Circle is between the _____ and the _____.
5. The Tropic of Capricorn is between the _____ and the _____.
6. The equator divides the earth into the _____ and _____ hemispheres.
7. The imaginary line which divides the earth into the eastern and western hemisphere is called the _____.
8. What direction is the Arctic Circle from the Tropic of Cancer? _____
9. South of the Tropic of Capricorn is the _____.
10. The equator line goes from _____ to _____.

Activity Exercise

Cardinal and In-Between Directions





Identify each point and fill in the blanks with the words north, northeast, east, southeast, south, southwest, west, or northwest. Notice that the direction on the top is different on both figures.

1. _____ 6. _____
2. _____ 7. _____
3. _____ 8. _____
4. _____ 9. _____
5. _____ 10. _____

The earth is made up of land, water and air. We know that the air is all around us. There are seven large bodies of land on the earth. These bodies of land are called continents.

The continents are: North America; South America; Europe; Asia; Africa; Australia; Antarctica.

The four large bodies of water are called oceans.

The oceans are: Atlantic Ocean; Pacific Ocean; Indian Ocean; Arctic Ocean.

Write the names of the continents.

1. _____ 3. _____ 5. _____

2. _____ 4. _____ 6. _____

7. _____

Write the names of the four large bodies of water we call oceans.

1. _____ 3. _____

2. _____ 4. _____

Continent or Ocean?

Write the letter C beside any of the following that is a continent and the letter O beside any one that is an ocean.

Atlantic _____ Europe _____ Asia _____

Africa _____ South America _____ Arctic _____

North America _____ Indian _____ Antarctica _____

Pacific _____ Australia _____

The earth is made up of: 1) _____ 2) _____ 3) _____

Shapes of Continents

Here are the shapes of the continents in order of their size.

Learn what each continent looks like and then try to find it on the globe.

Be sure that you can name the continents correctly.

What color are the continents on the globe?

Are they the same color on your wall map?

Practice writing the names of the continents, in order of their size in the spaces below.

1. _____ Asia
2. _____ Africa
3. _____ North America
4. _____ South America
5. _____ Antarctica
6. _____ Europe
7. _____ Australia

Write the names of the four large bodies of water.

1. _____
2. _____
3. _____
4. _____

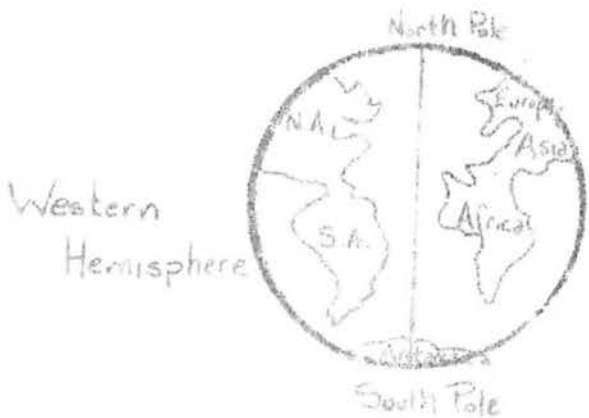
Continents on the Eastern Hemisphere and the Western Hemisphere

The globes above show the world divided into two hemispheres.

Do you remember what a hemisphere is?

These two hemispheres are the Eastern Hemisphere and the Western Hemisphere.

The Eastern Hemisphere and the Western Hemisphere are formed when the earth is divided from the _____ Pole to the _____ Pole.



Western Hemisphere

Eastern Hemisphere

Look at the pictures of the globes to answer these questions.

1. The continents in the Eastern Hemisphere are:

   a. _____

   b. _____

   c. _____

   d. _____

   e. _____

2. The continents in the Western Hemisphere are:

   a. _____

   b. _____

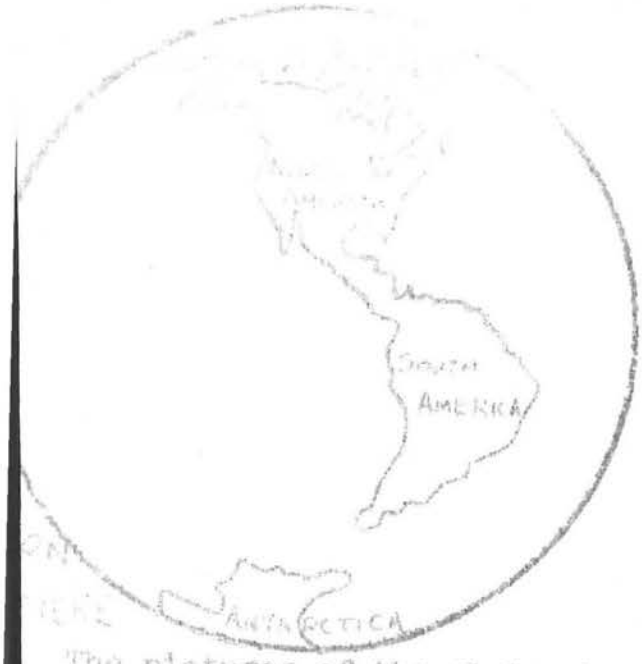
   c. _____

3. Which continent is partly in both hemispheres? _____

4. What continent do we live in? _____

5. Which hemisphere has more water than land? _____

Continents - Activity Exercise



The pictures of the globe show us the eastern and western hemisphere.

Using this globe, answer these questions.

1. Is there more land or water on the earth's surface? _____

2. Name the seven continents.

   1. _____ 3. _____ 5. _____

   2. _____ 4. _____ 6. _____

   7. _____

3. What is the name of the largest continent? _____

4. What is the name of the smallest continent? _____

5. What do we call the great bodies of water? _____

6. Name the great bodies of water. 1. _____ 3. _____

   2. _____ 4. _____

7. When you live in Massachusetts, in which ocean do you swim in?

   _____

8. On which continent do you live? _____

9. Which continent is east of Europe? _____

10. Which ocean is west of North America? _____

11. Which ocean lies between South America and Africa?

_____

12. Which ocean is the largest? _____

13. What else beside land and water is the earth made up of?

_____

14. Which two continents are so close together they almost look like one? _____ and _____

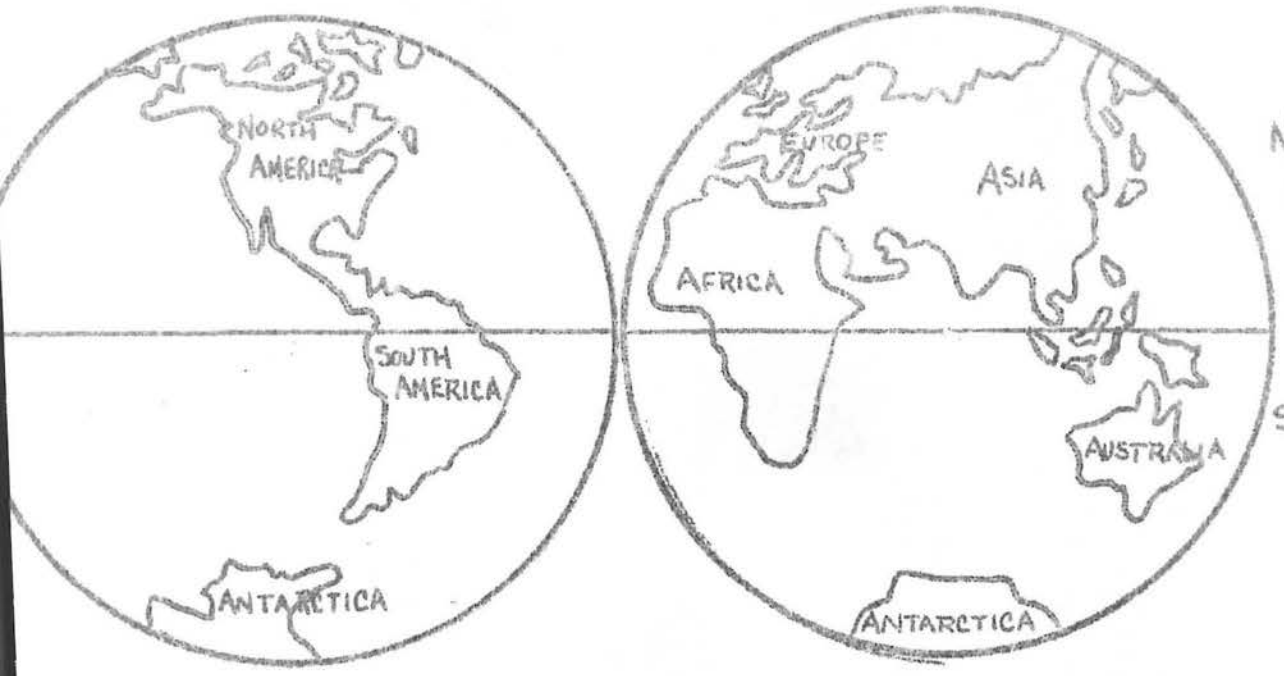
15. What imaginary line divides the earth to make the eastern hemisphere and the western hemisphere?

_____

Activity

Here are two globes that show the Eastern Hemisphere and the Western Hemisphere. Write the names of the continents on the correct area.

Continents on the Northern Hemisphere and the Southern Hemisphere



The globes above show the same continents that we have studied. This time the globes are divided into the Northern and Southern Hemispheres. The imaginary line which divides the earth into the Northern Hemisphere and the Southern Hemisphere is the equator. The equator is the imaginary line which goes around the center of the earth from east to west.

The equator divides the earth into two hemispheres called the _____ Hemisphere and the _____ Hemisphere. Everything north of the equator is in the Northern Hemisphere. Everything south of the equator is in the Southern Hemisphere. Look at the pictures of the globe to answer these questions.

1. What three continents are wholly in the Northern Hemisphere?

   a. _____

   b. _____

   c. _____

2. What two continents are wholly in the Southern Hemisphere?

a. _____

b. _____

3. What two continents are partly in both hemispheres?

a. _____

b. _____

4. What two continents does the equator cross?

a. _____

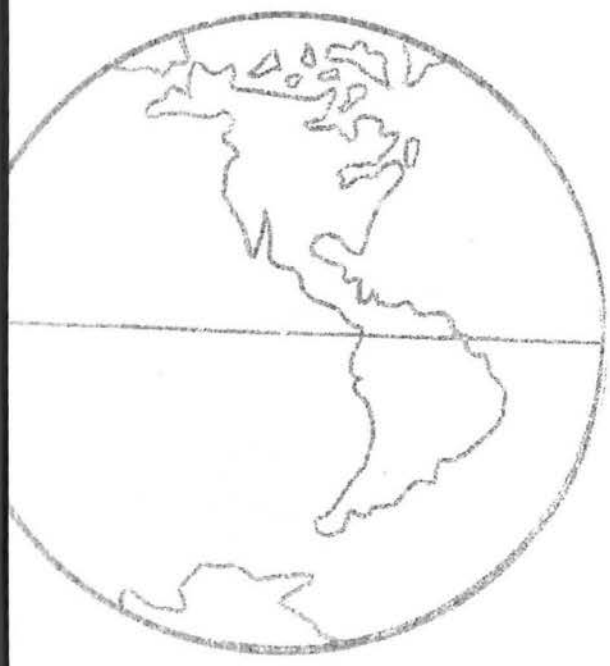
b. _____

5. Which of <u>these</u> hemispheres has more water than land?

_____

Activity

Here are two globes that show the Northern Hemisphere and the Southern Hemisphere. Write the names of the continents on the correct area.



Let's see now well you remember the shapes of the continents. Match the drawings below with the name of the continent. Write the name of the continent beside the drawing.

a. 

_____

b. 

_____

c. 

_____

d. 

_____

e. 

_____

f. 

_____

g.

_____

1. North America
2. South America
3. Europe
4. Asia
5. Africa
6. Australia
7. Antarctica

Review

The words below are the names of continents, oceans, and imaginary lines that you have studied. Decide whether each name is a continent, ocean or an imaginary line and place the word into the correct category under the heading.

1. North America
2. Indian
3. Equator
4. Atlantic
5. Europe
6. Asia
7. Capricorn
8. Australia
9. Antarctica
10. Pacific
11. South America
12. Arctic
13. Africa
14. Cancer
15. Antarctic

Continents	Oceans	Imaginary Lines

On this page, you see four globes showing the continents of the earth. Write the names on the correct continents. In the block beside each hemisphere, mark whether it is the Northern, Southern, Eastern, or Western Hemisphere. Color in all the space that is water with your blue crayon.

Review Exercise

Put the right number beside the name of the place for which it stands.

_____ Tropic of Cancer

_____ Arctic Circle

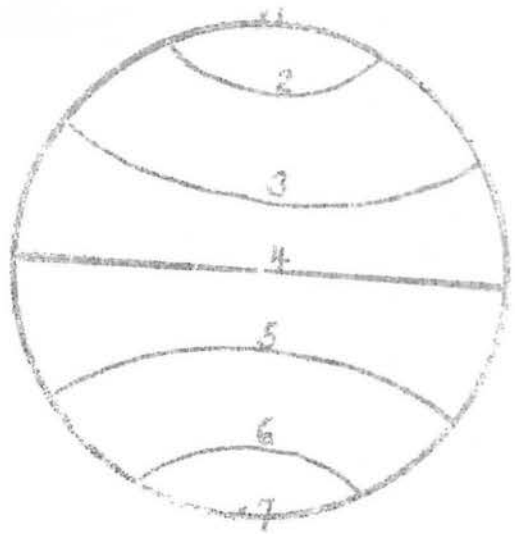
_____ Equator

_____ South Pole

_____ Antarctic Circle

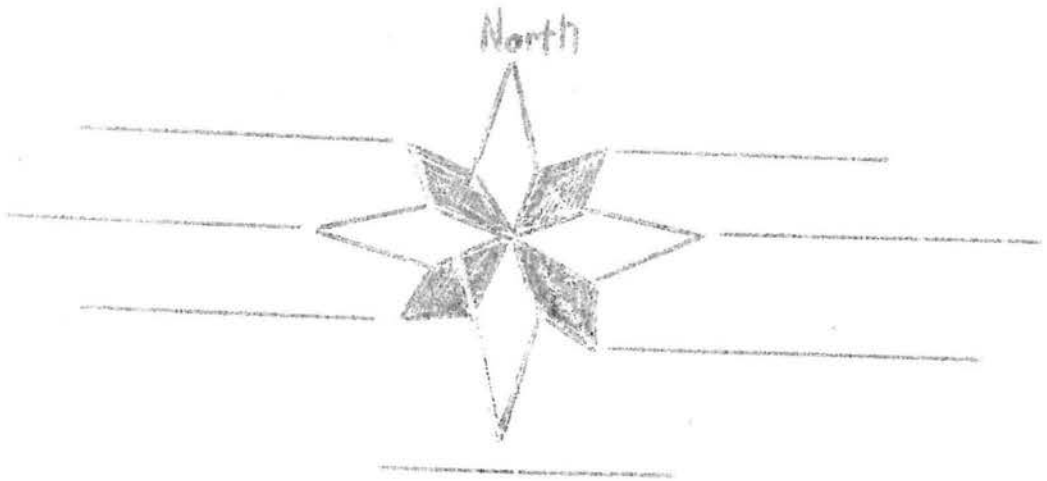
_____ Tropic of Capricorn

_____ North Pole



Review Exercise

Identify each point on the diagram below by writing the name of the cardinal direction or the in-between direction it represents.



Answer Sheet for Lesson V

Let's check our answers for Lesson V. If you have made any mistakes, read the lesson over again and correct the mistake. Keep this answer sheet with your lessons in your folder.

Page 1.

Atlantic O	Europe C	Asia C
Africa C	South America C	Arctic O
North America C	Indian O	Antarctica C
Pacific O	Australia C	

The earth is made up of: 1) land 2) water 3) air

Page 2.

1. Atlantic Ocean
2. Pacific Ocean
3. Indian Ocean
4. Arctic Ocean

Page 4.

1. a. Europe b. Asia c. Africa d. Australia e. Antarctica
2. a. North America b. South America c. Antarctica
3. Antarctica
4. North America
5. Western

Page 5.

1. Water
2. North America, South America, Europe, Asia, Africa, Australia, Antarctica
3. Asia
4. Australia
5. Oceans

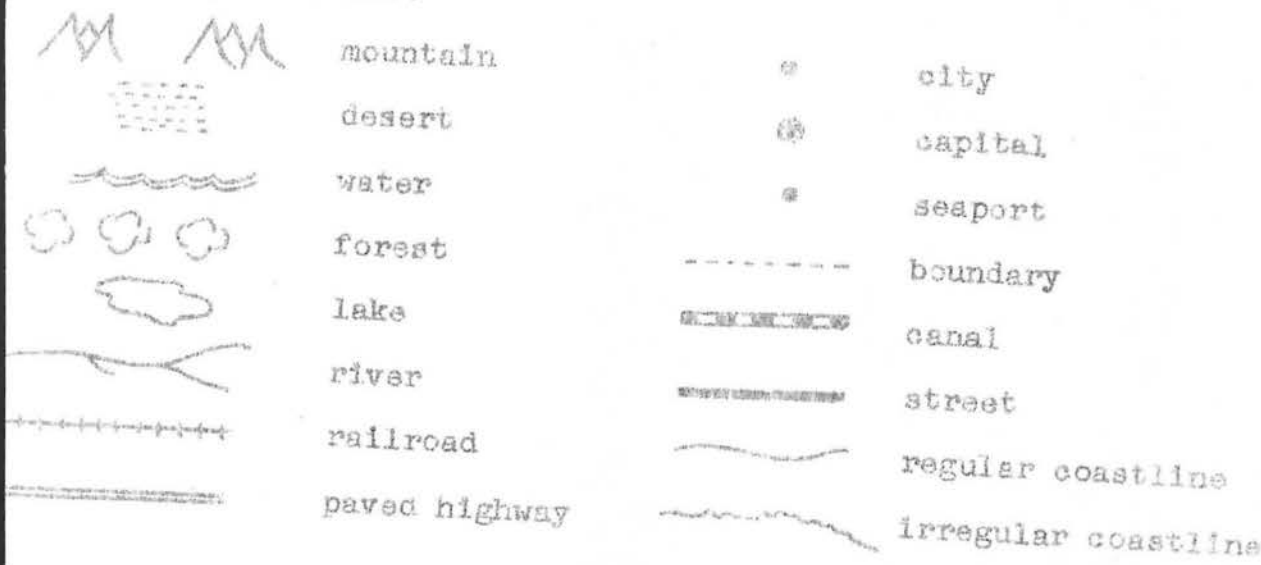
SYMBOLS

Symbols are sign language used on maps and globes to show something special. A symbol is used in place of the real object.

Symbols on a map or globe stand for features on the earth.

Many maps use the same symbols to make it easier for the map reader to understand his map wherever he may be. However, symbols can stand for different things on different maps.

Common symbols are:



Though common symbols often look like the figures they represent, it is always necessary to read the map key to see what the symbols mean on that map.

The map key tells the story of the map. Sometimes, the map key is called a legend.

The map key or legend also tells us about colors on a map. From the legend we are able to know what the colors show.

Blue on a map usually means water.

The different shades of blue show how deep the water is.

Light blue is shallow water.

Darker blue is deep water.

White on a map usually shows land that is covered with ice or snow.

Brown on a map usually shows highland.

Light brown is land where very few things grow.

Darker brown is land that is usually dry.

Green on a map usually shows lowland.

Light green shows land that is covered with grass or crops.

Darker green shows land that is covered with trees.

Use the symbol sheet if you have forgotten what each of the following things look like. Draw a symbol for each of these.

_____ forest

_____ railroad

_____ mountain

_____ capital

_____ regular coastline

_____ desert

_____ boundary

_____ water

_____ city

_____ canal

_____ lake

_____ street

_____ seaport

_____ river

_____ irregular coastline

_____ paved highway

Let's pretend that you were making a city map. Draw the symbol that you could use for the following:

_____ school

_____ factory

_____ bus stop

_____ traffic light

_____ church

_____ cemetery

_____ parking lot

_____ garden

Review of Common Symbols

1. Draw the correct symbol beside the word it represents in the right hand column.

1. 
2.
3. 
4. 
5. 
6. 
7.
8. 
9. 
10. 
11. 
12.
13.
14. 
15.

_____ boundary

_____ canal

_____ capital

_____ city

_____ desert

_____ forest

_____ irregular coastline

_____ lake

_____ mountain

_____ railroad

_____ regular coastline

_____ river

_____ seaport

_____ street

_____ water

---

2. With your crayons fill in the box using the color found on most maps for---

☐ shallow water

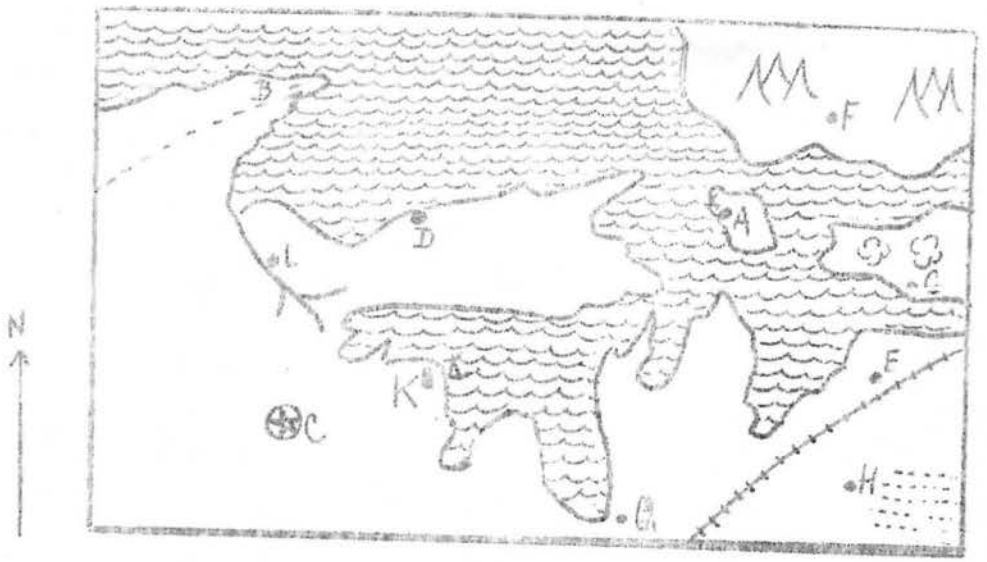
☐ land covered with grass

☐ land where few things grow

☐ deep water

☐ land covered with trees- like a forest

☐ dry land- like a desert



The key for common symbols will help you to identify the letters in the map above. Circle the correct letter in each sentence.

The capital city is ---------- H A C F

The city on an irregular coastline is -------- B G L K

The city closest to the railroad is ---------- F D A E

The seaport on a regular coastline is -------- B D K L

The city on a island is ---------- A B D F

The city in the mountain region is ---------- B D F G

The city in the forest region is ---------- C G K L

The city at a boundary line is ---------- A B G H

The city on the river's edge is ---------- K L C H

The city near a desert region is ----------D E H K

Which city is north of city H? ---------- A C E L

The city east of city A is ---------- D E F G

The city southeast of city K is ---------- A C D G

Which city is north of city A? ---------- D E F G

Which city is south of city L? ---------- A B C D