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ABSTRACT

Based on a state requirement that all elementary and secondary schools provide instruction in the wise use of natural resources and protection of the environment, the California State Department of Education has developed this guide to assist local educational agencies in translating legislative mandates into action. It offers a structure and guidelines for developing a curriculum suited to local needs that will meet state requirements. The concepts developed for the study of conservation and environmental protection go beyond the more traditional nature study and appreciation of the out-of-doors and consider the areas of social sciences, sciences, and humanities as well. The definition and basis for ekistics are explored and ideas for developing the ekistics curriculum are expressed. Cognitive-affective frameworks and curriculum outlines for elementary, junior, and senior high school levels are constructed for this purpose. A detailed example is given for the elementary school level with cognitive-affective schemes and their supporting concepts presented as conceptual pathways. For each pathway the concepts are defined, performance objectives stated, and supporting content suggested. Strategies for learning and teaching at all levels are also discussed. Suggested learning experiences, developed by the Los Angeles City Unified School District for the elementary ekistics framework, are appended. This work was prepared under an ESEA Title III contract. (A related document is ED 064 196.) (BL)

A Guide for the Development of an Interdisciplinary Environmental Education Curriculum

EKISTICS

CALIFORNIA STATE DEPARTMENT OF EDUCATION •
Wilson Riles, Superintendent of Public Instruction, Sacramento, 1973

EKISTICS

A Guide for the Development of an Interdisciplinary Environmental Education Curriculum

Cover photo by John Kaestner

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FOREWORD

During the past several years, a great public interest in environmental problems has developed. We Americans are at last becoming aware that we are living in a closed life-support system and that we must have adequate natural resources and a healthful environment if our human resources are to be fully developed.

Mere awareness of our environmental problems, however – important as it is – is not enough. We must also have an informed public that possesses the attitudes, knowledge, and skills necessary to identify, analyze, and solve environmental problems. This is essential if we are to reverse the present trend toward resource depletion and environmental destruction.

As educators, we have a vital role to play in helping an entire generation convert environmental concern into effective, constructive action.

I am most pleased that since the passage of the Miller Bill in 1968, which established an environmental education requirement, the schools of California have been making a great effort to provide environmental instruction. This publication was developed to assist you in providing such instruction.

It is my sincere hope and belief that this publication will prove of great value in your work with our most precious resource – the young people of California.

Superintendent of Public Instruction

PREFACE

In 1968 the California State Legislature wrote into the Education Code a requirement that all elementary and secondary schools provide instruction in the wise use of natural resources and protection of the environment in all appropriate grade levels and subject areas, grades one through twelve. In keeping with the spirit of Senate Bill 1, the legislation provided a broad mandate for an interdisciplinary conservation-environmental program in the schools, and yet provided a high degree of flexibility through which local educators could develop programs suited to the specific needs of the students they serve.

In its role of statewide leadership in the field of education, the State Department of Education has a responsibility to assist local educational agencies in translating legislative mandates into action. This publication, *Ekistics – A Guide for the Development of an Interdisciplinary Environmental Education Curriculum,* was developed with this responsibility in mind. Through it, we have tried to provide a structure and guidelines through which local educators may develop a curriculum suited to local needs that will meet the state education requirements in this subject area. The concepts developed here take the study of conservation and environmental protection far beyond the traditional notions of nature study and superficial appreciation of the out-of-doors. When one moves into the areas of the social sciences, arts, and humanities, which once were considered unrelated, the outlines of a curriculum begin to emerge that not only will help children understand their interdependence with the natural world, but will help them develop the skills, attitudes, and knowledge necessary to understand and solve environmental problems.

Ekistics – A Guide for the Development of an Interdisciplinary Environmental Education Curriculum was developed by the Conservation Education Service of the California State Department of Education. The original draft was prepared by a study team headed by Paul Brandwein, President of the Center for the Study of Instruction, San Francisco. This study team included Mrs. Margaret P. C. Winslow, Architect and Research Associate, Center for the Study of Instruction; Mrs. Mai Arbogast, Professor of Landscape Architecture, University of California at Berkeley; Christopher Vasillopulos,

Research Associate, Center for the Study of Instruction; Peter R. Frank, Coordinator of Social Sciences, Office of the San Diego County Superintendent of Schools, and part-time lecturer at the University of California at San Diego; Jack L. Davidson, Consultant in Outdoor Science, Environmental and Outdoor Education, Office of the Los Angeles County Superintendent of Schools.

Suggested learning experiences based on the elementary conceptual grid evolved by the study team were developed through an ESEA Title III environmental education project conducted by the Los Angeles City Unified School District. These suggested learning experiences are presented in an appendix.

The entire project was directed and coordinated by Rudolph J. H. Schafer, Consultant in Environmental Education, State Department of Education.

We hope that this work proves to be of value to the educators of California.

CLARENCE L. HALL
Associate Superintendent of Public Instruction

JOHN J. KLUMB
Chief, Bureau of Health Education, Physical Education, Athletics, and Recreation

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Photo by John Kaestner

Chapter 1

Ekistics: An Interdisciplinary Approach to the Study of Man and His Environment

A people – without a future – has no need to seek wisdom, has no need to change its behavior, has no need to maintain the "health of the environment."[1] This phrase, as René Dubos uses it, is no mere play on words, and it has more than a biological thrust. For the environment of man is no longer solely the land, sea, and air. Man has made his environment as wide as the cultures which comprise the family of man. Indeed, man's concept of environment is larger than the biological concept of earth, the physical concept of planet, or the cultural concept of world. Man now needs a larger mind to encompass this new concept of his environment. The cultivation of this larger mind is the function of education.

Education is an art-science concerned with the acquisition of knowledge and with the ability to consolidate knowledge which is yet to be discovered. To increase knowledge and to encompass the understanding and wisdom necessary for the wise conduct of life are both the aim and content of education.

When seen in this broader context, education about the environment takes on new dimensions and complexities, and the traditional terminology used to describe such a study appears inadequate. The authors propose the use of the term *ekistics*,[2] which is defined as that field of study, that area of knowledge, and those concepts and

[1] René Dubos, *Reason Awake*. New York and London: Columbia University Press, 1970.

[2] Ekistics is defined in the *World Book Dictionary*, 1970 edition, as the study of the ecology of human beings in settlements or communities. The word is often associated with Constantine Doxiadis, a city planner and president of the Institute for the Study of Ekistics in Athens, Greece, but he does not claim to have originated the term. The Athens Center of Ekistics was established in 1963 to further research and to foster international cooperation in all fields related to the science of human settlements.

Although Dr. Brandwein advocates the use of the term ekistics, that which we accomplish as educators in this vital area is much more important than the name we give to our efforts.

The Conservation Education Advisory Committee, in their 1969 Report to the California State Board of Education, used the term *conservation education*, but expanded its meaning

values through which man recognizes his interdependence with the environment as well as his responsibility for maintaining a culture that will sustain a healthy and sanative environment.

The discipline of ekistics, which delineates a host of experiences and a life-style as well, is now of consummate significance in the education of man and his young.

Man and His Environment

What constitutes the proper study of man in his environment? Why not limit the study to science? To ecology? To social science? To economics? To engineering? To a variety of technologies? In analyzing the relationship of man to his environment, the analysis has often been left to the specialist in a given field. Yet a study of the environment encompasses more than science, social science, or the humanities. Ekistics is an integral part of the domain of citizenship, and the citizen is not necessarily a specialist. This is not to say that an ekistician has no responsibility for an area of scholarship. Just as physicians are specialists, yet generalists, so are ekisticians. But just as every man is responsible for his body, so every man is responsible for the environment. By analyzing some decisions that have been made to alter the environment, a more appropriate synthesis may be developed.

Item 1

On Mount Shasta the United States Forest Service is clearing the scrubby and unsightly manzanita. The habitat of the manzanita is being altered; its place is being taken by hybrids of the ponderosa pine. The area may foster a productive and commercial forest.

Does the decision to create a new environment arise out of an ecological, economic, or aesthetic consideration?

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to include broad environmental concerns. In 1970, the Legislature wrote the term conservation education into the Education Code based on the language of the Advisory Committee Report.

In 1972 the Conservation Education Advisory Committee recommended to the Department of Education that steps be taken to adopt the term *environmental education* in an effort to bring state terminology into line with the federal act (Public Law 91-516) and in recognition of the general acceptance by the field.

In the Environmental Education Act of 1970 (Public Law 91-516), environmental education is defined as "the educational process dealing with man's relationship with his natural and man-made surroundings, and includes the relation of population, pollution, resource allocation and depletion, conservation, transportation, technology, and urban and rural planning to the total human environment."

Clearly, a decision must be made by those using this publication. If the term ekistics is acceptable, there is no problem. Should another term be preferred, it can, in most cases, be substituted for ekistics throughout the work without diminishing its basic structure and philosophy.

Item 2

Tree farming is increasing. The United States Forest Service and private companies are developing healthy stands of fir and pine trees. Regular management, short-rotation logging, chemical spraying, and other means of cultivation eliminate entire species of shrubs, perennial flowers, ferns, mosses, lichens, fungi, bacteria, as well as insects, amphibians, reptiles, and birds that depend on them. When dead trees are removed, where do woodpeckers, chickadees, and other birds build their nests? Or is this important?

Item 3

Any air traveler in California can see smog over Los Angeles, San Jose, and the Central Valley; however, this phenomenon is no longer limited to California. The Great Steel Arch in St. Louis is almost lost in smog, and vast farmlands are covered by a gray shroud.

The Apollo 10 crew saw the gray plume of smog over Los Angeles. Schoolchildren in Los Angeles are advised to avoid overexertion and deep breathing on smoggy days.

Were the decisions that produced the smog problem influenced by biological, economic, sociological, or psychological factors?

Item 4

Most Californians, approximately 80 percent, live in cities. The population grows by about 250,000 persons per year, roughly equivalent to the population of Sacramento. This massive growth

Smog is no longer unique to California.

necessarily causes social, political, and economic problems that must be solved.

Modern man, we are told, has carbon monoxide in his blood, DDT in his fat, strontium-90 in his bones, mercury in his tissues, and asbestos and lead in his lungs. On the other hand, some governmental agencies have published statements that pollutants are below the control level that is harmful to life. Such contradictory reports have left the public confused. Three truths, however, have emerged: (1) man's physical health is dependent on the health of the environment; (2) man is responsible for his environment; and (3) man is polluting his environment. Teachers cannot afford the luxury of doom forecasting; they must work with the children to find solutions. The very act of growth in a child is a hopeful act; schools should not destroy hope. But teachers must educate children to face issues. If they are to conserve children, are teachers not equally charged with conserving the environment?

Teachers have powerful measures at their command – the arts of teaching and learning – to combat environmental destruction. To prepare the way, a curriculum of the community of concepts and values is needed. By means of a curriculum, a program of instructed learning can be designed through which children can inquire into the environment in a manner that is relevant to them. Instruction creates and disseminates a world of meaning that comes out of experience in search of meaning.

What ingredients, concepts, generalizations, and principles make up the study of ekistics? What areas of content and what disciplines are involved? Does it have its own bases, its own succession of problems, and its own solutions?

An Ekistical Probe

On the preceding pages several ekistical situations have been investigated. Now a typical ekistical problem will be analyzed. From the analysis perhaps a new direction can be found for the field of ekistics as a community of discourse.

The following is an abridged analysis of a report prepared by the Conservation Foundation in June, 1969, concerning the action of citizens to save San Francisco Bay. Note that it is citizens, the product of our schools, who did the "saving." What is it they had to do? What is it they had to undo? What problems did they face? What did they need to know? How did citizens and professionals solve their problems? How complex are the problems of conservation of the environment?

San Francisco Bay can be protected by community-wide land-use planning.

"A Classic Confrontation in California: Citizens Move to Save San Francisco Bay"[3]

One of the nation's most dramatic environmental struggles has entered a tense, crucial stage in California. At issue is the future use and appearance of a magnificent estuary, San Francisco Bay.

In the name of economic needs and progress, various cities, counties, and private interests wish to continue filling in and developing the fringes of the bay. At odds with them are many conservationists and others who seek greater protection of San Francisco Bay's natural beauty, its recreational potential, and its resource values.

Analysis of the fields of knowledge or disciplines that comprise the area of ekistical fields embraced (to be part of the curriculum)

Sciences (biology, economics, ecology, mineralogy)

Social sciences (economics, geography, political science, city planning)

Humanities (aesthetics, ethics)

[3]*Conservation Foundation Newsletter.* Washington, D.C.: Conservation Foundation, July 9, 1969.

The struggle has been going on for almost a decade, but it has now come to a head in the California State Legislature. This body has the power to pass strong protective measures or to allow the uncoordinated, destructive development to continue.

Politics

Citizens' action

Legislation

For almost five-million people who live near its shores and for millions of visitors, the bay is a beautiful and refreshing open space as well as a source of recreation. San Francisco Bay, with its many square miles of marshes and mud flats, supports an extensive marine life and is a haven and feeding ground for millions of waterfowl.

Aesthetics

Values

Biological study

Migration (ornithology)

The large bay, with its great flushing action of tides sweeping in from the ocean and out again, not only helps maintain marine life, but is important in breaking down and disposing of vast wastes from the area and minimizing water pollution. Further, the surface of the bay is a moderating influence on the weather.

Marine life

Climatology

San Francisco Bay is one of the world's great harbors, and its rim is dotted with ports and water-oriented industries. It also produces important yields of commercial fish, oyster shells, sand, and salt.

Resources

San Francisco Bay has always been an attraction for fishermen and tourists. But others, such as land developers, realtors, investors, manufacturers, government officials, and legislators, have considered it to be some of the most valuable real estate in California. For more than a century, it was treated as such by the state itself.

Land developing

Much of the bay – including submerged lands, tidelands, and marshlands – was sold by the state of Califor-

Private ownership

nia to private interests, sometimes for as little as a dollar an acre. Some was filled and built upon; much more is still held by investors with plans for future development. Large areas were diked off and are used as salt ponds for production of salt by evaporation. Other areas were granted by the state to cities and counties for harbor, airport, and other developments. In 1850, when California was admitted to the Union, the surface of the bay at mean tide was about 680 square miles. Now the bay covers an estimated 430 square miles.

Mathematics (computing skills)

City planning

Management of resources

Public ownership

California history

Private interests control about 22 percent of the bay; cities and counties, about 23 percent; the state, about 50 percent; and the federal government, the remaining 5 percent. Why is the bay so attractive to land developers? For one thing, 70 percent of the bay is less than 18 feet deep at low tide, and the U.S. Army Corps of Engineers has estimated that some 248 square miles can be reclaimed. This makes it possible to create valuable waterfront real estate at a very low cost per square foot.

Relationship of government to private interests

Federal and local relationship

Because of the fragmented political jurisdiction of the Bay Area (nine counties) and the absence of regional control, local governments are free to act in their own economic self-interest. Local officials have considered the bay a most convenient outlet for expanding port facilities, laying more highways, extending airport runways, and dumping solid wastes.

City planning

Much of the privately owned land around the bay has fallen into the hands of several large owners. The owners are understandably interested in utilizing and developing these land holdings in a manner profitable to their stockholders.

Monopoly

Conflict of private and public interest (political, social, economic)

Public reaction to physical threats against the bay has been strong. When the Save San Francisco Bay Association was founded in 1960, it took two important steps. First, it prompted a study by the University of California's Institute for Governmental Studies. The result of this study was a book, *The Future of San Francisco Bay*, which was published in 1963. The book effectively dramatized the threats to the bay and served as a beacon for subsequent efforts to protect the bay. Second, the group enlisted the support of an aggressive and influential legislator, the late State Senator J. Eugene McAteer of San Francisco. Senator McAteer, aided by the University of California study and increasing pressure from the public and the press, pushed through a bill creating a commission to make an official study of the San Francisco Bay problem. The commission reported that piecemeal, uncoordinated development of the bay was most ill-considered. It recommended that the bay be protected and that a regional plan for its management be prepared.

Planning for action (by citizens)

Research (inquiry)

Political action

Regional planning

Aided by Assemblyman (now Senator) Nicholas C. Petris of Oakland and pressured by the association, McAteer managed the passage of a law creating the San Francisco Bay Conservation and Development Commission (BCDC). This commission, made up of 27 members from various fields, was charged with making a detailed study of the bay and preparing a "comprehensive and enforceable plan" for the conservation of the bay and the development of its shoreline.

Legislative process (political leadership)

Lobbying

Planning for conservation

The legislation noted that "no governmental mechanism exists for evaluating individual projects as to their effect on

the entire bay . . . (and) a new regional approach is necessary."

Even more important and precedent setting, the legislation gave BCDC some potent muscle during the study and planning period: it required anyone wishing to fill any part of the bay to obtain a permit from BCDC. Further, the legislation specified that any proposed development must be: (1) "necessary to the health, safety, or welfare of the public in the entire Bay Area"; or (2) "of such a nature that it will not adversely affect the comprehensive plan being prepared."

The completed document submitted to Governor Reagan in January, 1970, has been acclaimed as a remarkable plan, one which could well serve as a model for other estuaries and coastlines. One of the plan's principal policy statements is the following:

"The most important uses of the bay are those providing substantial public benefits and treating the bay as a body of water, not real estate."

Sydney Howe, Acting President of the Conservation Foundation, concluded the report with the following: "There is much at stake in San Francisco Bay."

Few, if any, other natural resource decisions that are being faced across the nation today so directly concern the daily lives of millions of persons. Nowhere else in the nation has such a thorough and truly ecological investigation been made of a complex resource issue. The San Francisco Bay Conservation and Development Commission plan is a landmark achievement in both land-use planning and regional consensus.

Regional collaboration

Granting of authority

Social responsibility

To save the bay will require professional and vocational skills that would strain the resources of all but a technological society.

The school curriculum should help to promote:

1. Basic knowledge of the natural environment (biology, ecology, geology, astronomy, and oceanography) and man's interdependence with it (ecology, philosophy, physical and mental health, and aesthetics)
2. Knowledge of the basics of environmental technology (soil and water conservation, forestry, agriculture, mineralogy, wildlife management, and mathematics) and the skills of resource conservation (practical arts, industrial arts, and home economics)

We must stop adding to the environmental casualty list, and San Francisco Bay is a good place to draw the line.

3. Knowledge of the social sciences as they affect the environment and its resources (philosophy, economics, political science, geography, sociology, and history) and the social skills of conservation (consumer economics, citizenship, contemporary issues, and law)
4. Ekistical content must be a part of the total school program in all appropriate subject areas and grade levels and should relate directly to the lives of the students.

Conclusion

The thrust of the foregoing analyses and syntheses is that ekistics is:

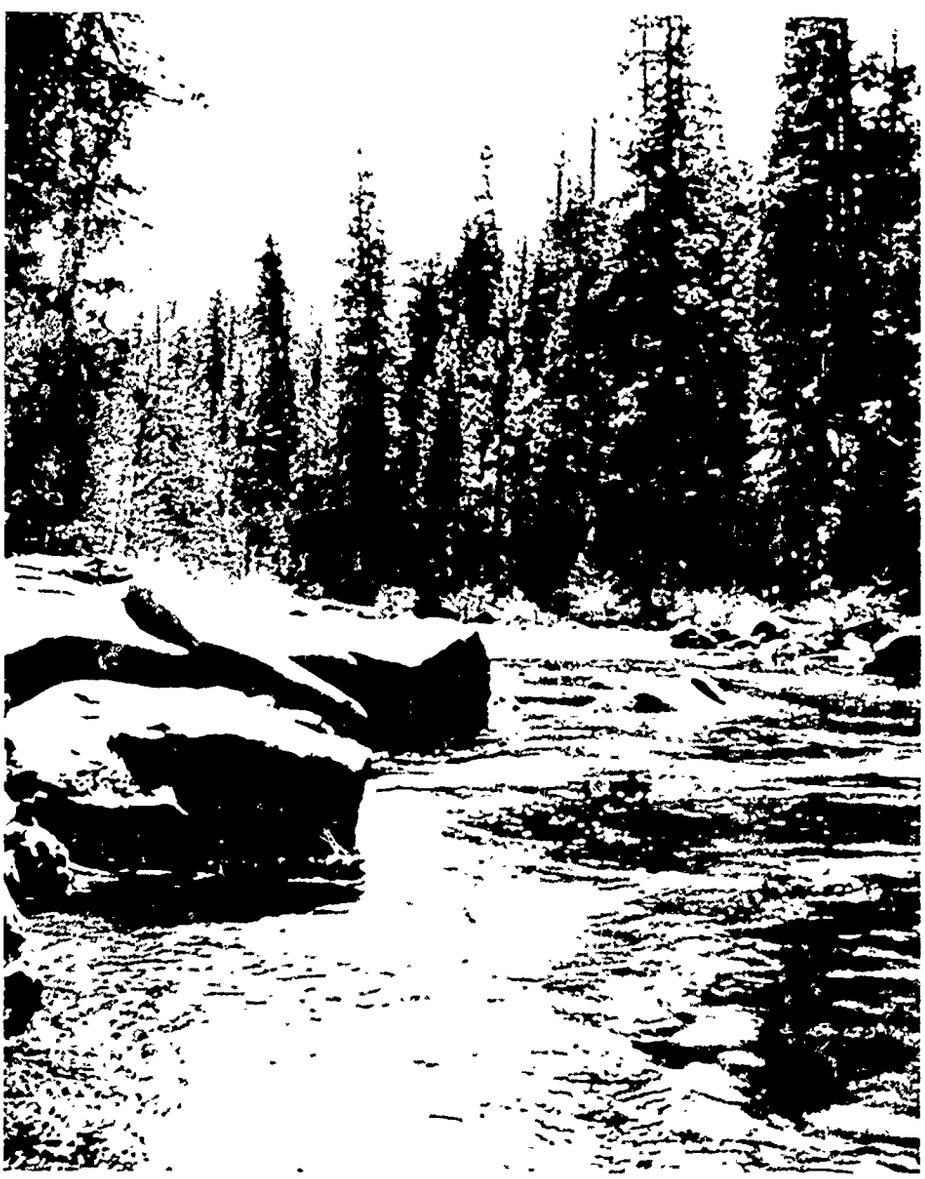
- A field of study that pervades our modern life and, therefore, should be of wide appeal and interest
- An essential part of the education of all members of society

Before any of the countless environmental problems can be solved, citizens not only will have to become informed, they will have to develop a sense of mission. Ekistics can convey the necessary knowledge, skills, and attitudes; it also can convey this sense of mission.

Ekistics is concerned with significant aspects of science, social science, mathematics, and the humanities. The traditional concepts of conservation and conservation education, through which man viewed natural resources merely as a collection of valuable commodities to be manipulated for his immediate and short-term benefit, are now clearly inadequate.

If the trumpeter swan and the sequoia are to be saved, for example, is not society faced with ethical and aesthetic, as well as economic and scientific, alternatives? Is it ethical to expend resources to save the trumpeter swan while some Americans live in squalor?

Those who are concerned with the population "explosion" are advocating zero population growth (zpg). If we try to approach zero population growth, do we not face vast economic, social, political, scientific, ethical, aesthetic, and moral problems?



Chapter 2

Developing the Ekistics Curriculum

One can easily be overwhelmed today. The times demand ingenuity as well as expertness. But expertness demands restraint, for the expert seeks constraints on the basis of his art and science. What are the constraints of that community of discourse called ekistics? What are its concepts, its values, and its modes of inventing and initiating action?

Ekistics is concerned with the health of the environment. Its practitioners, whether scientists, economists, city planners, architects, or outdoor educators, are ekisticians if their goal is to heal the environment. Medical plans are preventive or remedial stratagems for treating the health of the community. Ekistical plans can prevent mistreatment of the environment. By practicing the principles of ekistics, the community can maintain the beauty and sanative nature of its environment in ecological balance.

Ekistics has its knowns and its unknowns. How does a society come by its knowns? How does a child consolidate experience? How does society probe its unknowns?

A society's knowns and unknowns come not only out of the modes of empirical validation that are expected of the scientist, but also out of the nonempirical validation of the artist and the philosopher. A forest is an ecological as well as an aesthetic entity. The ekistical problems and solutions come not only out of factual theory, but out of normative theory as well.

In this chapter, the constraints of the domain of ekistics will be analyzed under the following headings: (1) Concepts and Values; and (2) Cognitive Frameworks and Instructed Learning.

Concepts and Values

All human beings, in one way or another, are adapted to their environment. They are adapted by their genetic inheritance and by their cultural inheritance. Once born, they are limited by the constraints of their physical structure. They can realize the full potential of this physical structure by their adherence to the rules of good health, recognizing the need for adequate exercise, rest, and

medical care. Individuals can, and do, change their behavior. Biological evolution and cultural evolution both have made man what he is, but not necessarily what he will be.

Physical adaptation is no longer as significant for man's survival as is his cultural adaptation. Sufficient evidence exists to support the claim that the concepts and values that children learn in their school years will determine what they do or do not do in later life.

One hears of the "problems" posed by pollution, population, pesticides, and pressures on resources. Why do some persons not recognize these as problems? Is it because the framing of a problem, in counterpoint to the framing of a question, is an art that requires great skill? An ability to recognize and clarify problems is precisely an ability to frame and penetrate into strategies for solution.

Mental activity is generally directed by objects and events. If the object or event is not recognized, a problem concerning the environment may not be clear to everyone at the same time. Indeed, an object or event is recognized only when the concept to which it has relevance is understood. Otherwise, the problem may not be clarified. To most of the world's inhabitants, problems in conservation of resources – pollution, pesticides, population, and pressure on resources – are not clearly perceived until they become critical. This is because the ekistical base that undergirds the conservation and preservation of the environment is not understood.

Inadequacies and Superficialities

Observations in 1,092 school systems during the past five years and the study of over 2,400 curriculums (375 in California schools) indicated that every school system studied, elementary and secondary, embraced conservation in its stated curriculum. But a closer examination revealed that the topic is not even considered in about 65 percent of the schools. Particularly in city high schools, conservation is thought to have little importance and relatively little intellectual rigor; hence, little respect. Many think conservation has been adequately "covered" on television or in newspapers and magazines. Furthermore, in crowded cities there are few if any natural fields, ponds, or streams available for that "necessary" field trip.

In rural schools, environmental education is generally thought to be unnecessary. There it is assumed that everyone lives in the out-of-doors. One is expected to learn the concepts and values of conservation without effort; however, even though the experiences of conservation are part of rural life, the concepts and values may not be. The country town is not always beautiful; the abandoned

Current environmental education programs are not always effective.

automobile may be found amidst the wild flowers. The barbed wire around pastures may be nailed to trees; weeds may clog the cultivated garden or vegetable patch. The examples are numerous. The evidence of the value of outdoor education is not always clear. Nevertheless, the hope of its effectiveness is always present.

Environmental education would be respected more if the ecological, economic, and psychological concepts underlying practices in conservation were included in the curriculum. In some schools, conservation education consists of an occasional walk in the woods or, what is worse, along a "nature trail," for the trivial naming of specimens. Too often, the field trip is conducted by an agency outside the school. The field trip can be a visit to a kind of concentration camp for organisms that cannot otherwise survive. The field trip is not, generally, an experience in search of meaning; it is not part of a curriculum or community of discourse.

Nobody in the past really took conservation education very seriously. One did not write books on "Why can't Johnny conserve?" Who became indignant when a child was unable to see beauty around him?

As conservation became crucial in the minds of the public and its leaders, the question was not, "Is there a place for environmental education in the curriculum?" The question was, "How can the schools most effectively propagate conservation attitudes?" All too often the attempt could be described as propagandizing rather than concept-seeking or value-seeking.

Concepts and values are the anvils on which philosophies, policies, and practices can be forged. But meanings, understandings, concepts, and values must also be related in a structure; in effect, a curriculum. A school has structure, and it develops educational structure by means of a curriculum.

Is it possible to develop a curricular structure in which the teacher can find scope as well as sequence? The teacher needs a structure in which intellectual disciplines can thrive. The children must have opportunities for a wide experience in search of meaning, irrespective of whether that meaning is gained from the nonrandom experience of instructed learning or the nondirected learning that results from random experience.

If the child lives in the cultural environment of a family, his adaptations are learned through a variety of experiences, which may be random or nonrandom.

A touch of a hot radiator may be a random experience through which the child will learn. On the other hand, his experience in religion may be nonrandom, because his experiences are directed by others. His religious experience is indeed learned, but the form of experience on which his learning is based is significantly different from that of random experience. His religious experience is directed or instructed learning. The instruction is planned and effected through agencies that are concerned with a general mode of instruction in which the modes of concept-seeking and concept-forming are planned, and the concepts and values are within the plan. Curriculum planners are mainly concerned with instructed learning and with random experience outside the school environment.

Schooling is synonymous neither with education nor with learning. Schooling is mostly a result of instructed learning; and instructed learning depends largely on curriculum.

The scholar does not wake up "new" and inexperienced each morning exclaiming, "What exciting discovery shall I make today?" His problems arise out of prior concepts or out of prior values. When he is confronted with an object or event which does not fit his conceptualization, he may recognize a problem. But this ability to

recognize a problem almost always depends on the possession of concepts that are gained through experience. The possession of a concept and its consolidation in understanding are antecedent to the recognition of a problem.

Conceptual Approach

At one time facts may have seemed relatively stable. Today the world is experiencing not only a population explosion but also a knowledge explosion. Each day scholars produce volumes of new information. Facts are inundating teachers and students at an ever-accelerating rate.

The school can no longer be a place where only the facts are presented. That part of the early sanative environment called school must be a place where the student learns an art that prepares him for acquiring knowledge and skills that are not yet known or even in demand. Is this possible? Yes. One scholar is interdependent with the community of scholars who preceded him. One concept stems from another. Concept replaces concept, but rather slowly, for a concept is based on prior networks of inferences and on prior observation of objects, events, and behaviors. To be specific, the term *mammal* evokes in one's mind different objects such as horses, dogs, and cats, as well as different events such as suckling of the young.

A concept isolates common attributes of objects, events, and behavior. Values, on the other hand, isolate common attributes of objects, events, and behaviors that society prizes or values. Man prizes the beauty of wilderness and its peace. Man values liberty, freedom, and education. Thus, erosion, smog, population, and pesticide can be considered concepts. Taxonomically speaking, concepts can be placed under a larger heading, conceptual schemes, and ordered into subconcepts.

Once man possesses concepts, he can make associations. A goose is expected to have feathers and to lay eggs. These characteristics are associated in man's concept of bird. Population is an entirely different mental geography; however, the two are related within another concept, population pressure. Concepts help man associate or synthesize. The area of ekistics is, therefore, an array of concepts.

Values

In examining values, the affective area should be distinguished from the cognitive area. Values are affected criteria. They are standards of what a person feels to be desirable. Values function when a person is faced with alternatives in making a judgment. A person must possess values before he can make value judgments; that

is, judgments about the desirability, fitness, or quality of an object, event, or behavior.

Values are predominant in making a decision when knowledge is inadequate or unavailable. Values become involved when there are two or more choices, each of which has possibilities for action. The choices available in the conflict of values over the proper use of San Francisco Bay were "to fill" or "not to fill." Values also come into play when there is a value conflict. In addition to valid and possible alternatives, there also must be some degree of value conflict within the individual's own system of values. A particular value in the person's value system may invite positive action toward one alternative, and another value in the same system may signal danger. Economic values were in conflict over the use of San Francisco Bay. "To fill" might realize more income; "not to fill" also might realize more income.

Judgments often are made without all the facts, especially when all the facts are not available. Even before a conceptual framework may be clear, a decision may have to be made. Concepts and values merge whenever a decision is being made.

Concept-seeking and value-seeking become legitimate objectives of the teacher. Concepts and values are joined in the cognitive-affective schemes that undergird a curriculum in ekistics. For example, a cognitive-affective scheme such as interdependence involves many concepts, such as photosynthesis, symbiosis, community, irrigation, city planning, and resources. Interdependence also involves values, such as respect for individuals, respect for property, equal rights (political and legal), and responsible action (care of soil, water, house, and street).

A major objective of teaching in ekistics is to foster the understanding of major conceptual schemes developed by scholars. Curriculum planning and lesson planning are simplified when teachers consciously undertake to develop a course of study around the major conceptual schemes of the area being considered and to plan their daily work around the concepts underlying these conceptual schemes. The laboratory, the field, and the classroom then become places for discovery; for testing of values; and for discriminating and associating data into facts, facts into concepts, and concepts into conceptual schemes.

Individuals obviously could not discover for themselves all the cognitive and affective schemes presently known. The schools therefore need teachers who can recreate for the young the heritage of the past, both in attained cognitive-affective schemes and in the means of attaining them. Subsequently, the thesis will be developed

that this is best done through experiences in which thought is related to action; that is, through investigating, instructed learning, and individual probing outside of the teaching environment. The child thus may be able to acquire the apparatus of attaining the conceptual schemes of the future. The very nature of learning consists of concept-seeking and value-seeking activities that lead to concept and value formation. The concepts and values formed should be functional so that their understanding and application will lead young people to live more effectively. Concepts and values, along with the activities and objects which illumine them, are the content of the proposed curriculum. Concepts and values undergird action as well as understanding.

Cognitive Frameworks and Instructed Learning

A cognitive framework can be developed to give education an intellectual discipline; that is, a network of inferences or relationships that can give structure to a curriculum. Further, the affective options that determine decisions are inseparable from the cognitive-affective schemes. To learn structure is to understand the relationships of objects and events to each other. The interrelatedness of a community of discourse (such as ekistics) can be demonstrated; that is, knowledge can be disciplined so that the method by which further knowledge is acquired has discipline.

A discipline is acquired through disciplined study. The modes of a discipline, as a study, are never haphazard. The student acquires the disciplines or the constructs of ekistics and skills through probing, investigation, and inquiry. This simply means that the student must expend energy in learning. He should not be robbed of the right to bend his own efforts to uncover the concept nor of the "pain" or effort necessary to discover the concept. The teacher's art is expended in preparing the learning situation in which the investigating occurs.

Early education in ekistics can be based on a structure which is sound because it is built on concepts and values; that is, the elements of the structure are related and relevant. Those who will conserve need grounding in the full scheme of man's past, not in the parochial specifics of conservation or preservation of land or water as practiced in an earlier, agricultural economy. Ekistics is relevant to modern life and to the problems and successes of the future. Furthermore, the structure of concepts gives meaning to experiences because the constructs pervade the school experience; that is, the curricular structure in which the experiences occur. This meaning is not achieved when unrelated bits and pieces are thrown together in a

A CONCEPTUAL FRAMEWORK IN EKISTICS FOR KINDERGARTEN THROUGH GRADE SIX

Level 6. Man is the prime agent of change of the natural environment.	Level 6. Man modifies the environment in order to utilize his resources and to increase them.	Level 6. Men recreate their environment.
Level 5. The environment is and has been in constant change.	Level 5. Social aims determine the utilization of resources.	Level 5. Men create objects, events, and behaviors that nurture their images of beauty and order.
Level 4. Life converts matter and energy into characteristic species form.	Level 4. Men interact to utilize the world's available resources.	Level 4. Cultures are characterized by their special ways of reacting to the environment.
Level 3. Life and environment interchange matter and energy.	Level 3. Men utilize the environment to secure their needs.	Level 3. Men, responding to special environments, create objects and events symbolic of their interaction.
Level 2. There are different environments, each with characteristic features and life.	Level 2. Men develop different modes of adaptation to life in different environments.	Level 2. Men seek out objects, events, and behaviors symbolic of beauty.
Level 1. In any environment, living things have similar needs.	Level 1. Men live in different environments.	Level 1. Men interact mentally and emotionally to the objects and events in their environment.
Cognitive-Affective Scheme *Man is interdependent with his natural and physical environment.*	Cognitive-Affective Scheme *Man's social behavior is basic to maintaining, altering, adapting, or destroying the environment.*	Cognitive-Affective Scheme *Man utilizes his symbolic and oral traditions to maintain or alter the environment.*
Conceptual Pathway A Interdependence In Interchange of Matter and Energy SCIENCES	Conceptual Pathway B Interdependence – In Social Interaction SOCIAL SCIENCES	Conceptual Pathway C Interdependence – In Cultural Components and Forms HUMANITIES

period of time through a sequence of topics that are unrelated in structure.

All data from investigations in curriculum and instruction and in teaching and learning indicate that a study that affects life and living should pervade life and living. The concepts and values that pervade ekistics also pervade growth. Work in ekistics, therefore, should be a part of the elementary, junior high school, and high school years.

Elementary Years

The conceptual pathways can be laid in the primary or intermediate years. Results of investigations in the sciences, social sciences, and humanities have indicated that children in these years are able to probe the sinews of major concepts. Although the point at which the concept of total environmental interdependence is developed in the child will vary from individual to individual, it will occur for most during the intermediate years. Without the basic probes, it will probably not occur as early as the primary years.

Intermediate Years

In the intermediate and junior high school years, the curriculum should include out-of-door activities.

In the intermediate years, a concentrated experience in the out-of-doors is recommended. A natural environment should be selected that is dominated by plants and animals growing in a verifiable, ecological relationship that has not been seriously disturbed by man. Analyses and syntheses in the field are thus possible. This might constitute an extended camping experience or field trip.

In the junior high school years, the students might make a concentrated study of a town or city for the purpose of observing relationships in such environments. Analyses and syntheses of problems in this selected field are thus possible.

High School Years

In the senior high school, a full-year course in ekistics should be made available to all students. The study would span many fields including the sciences, social sciences, and humanities. The course might be conducted by one teacher or a team of teachers.

The cognitive-affective constructs (concepts and values) that make up the framework of ekistics are presented on the following pages. They are plotted as conceptual pathways from experience in the first through sixth levels and in junior and senior high schools.

The term level is not interchangeable with grade. Level indicates a level of maturity, experience, and understanding. In certain schools,

Photo by R. L. Thompson

An outdoor learning experience can be a part of the total curriculum.

children in grade one might be engaged in studies fitting a Level 2 concept; in others, children in grade four might be engaged in experiences fitting study of a Level 2 concept. The segmentation of the concepts is, for the sake of convenience, structured for the curriculum planners who must orchestrate the learning experiences throughout the elementary school years.

A Conceptual Framework in Ekistics for the Junior High School

Each cognitive-affective scheme embraces a unit of work within four areas of the curriculum: (1) sciences; (2) social sciences; (3) humanities; and (4) health. The work involves verbal, mathematical, and artistic skills. The appropriate placement of each unit depends, of course, on the curricular planning of the school.

Cognitive-Affective Scheme I. Societies perceive environmental issues of their time on the basis of past experience.

Cognitive-Affective Scheme II. The interaction of the culture with available technology determines the nature of the environment, which is planned and developed.

Cognitive-Affective Scheme III. Social issues and decisions alter the environment.

Cognitive-Affective Scheme IV. Social issues and decisions determine the utilization of all resources.

A Conceptual Framework in Ekistics for the High School

Cognitive-Affective Scheme I. In any given environment, organisms are linked within an ecosystem.

Cognitive-Affective Scheme II. Issues and decisions affecting the world ecosystem reflect the pressure of population upon resources.

Cognitive-Affective Scheme III. Wise utilization of the environment is dependent on the organization of shortage.

Cognitive-Affective Scheme IV. The concepts and values man accepts as guides to his future behavior determine the quality of his life, if not his survival.

A Curriculum Outline for the Elementary School

The term *environment,* as applied to man's interdependence with it, is not a viable one if it constitutes only his relationship to a biological or natural environment. A bridge or house is as natural to man as a beehive or honeycomb is natural to a bee. Man's environment is not only biological and cultural; it is aesthetic, ethical, economical, social, and political. Man's environment is the forest, the sea, the prairie, the farm, and the factory; it is his home and community. Today one speaks not only of pollution by pesticides, but by noise; not only of destruction by flood, but by the bulldozer; not only disrepair by natural erosion, but by man's willful neglect. A neglected or misused field is ugly; so is a city that is speckled with refuse.

A concept of instruction held by all theorists and practitioners of the teaching art is that a student's learning is known by his response; that is, by his behavior. Producing a change in behavior is synonymous with education. The goal of the ekistics curriculum is to produce those changes in human concepts and values that result in the following:

1. Recognition in word and deed by the student that he is interdependent with his environment.
2. Behavior that demonstrates by word and deed that the student supports a culture that will sustain a healthy and sanative environment.

Photo by V. B. Scheff

Sea lions and other marine mammals have come perilously close to extinction.

Experience in ekistics is not to be confined to the school because the school is only the catalyst. For example, a group of citizens, including students, is patrolling the Santa Barbara Islands in a useful and effective attempt to conserve the sea lions there.

In the elementary years, the community of discourse is the entire elementary curriculum. Ekistics should pervade all subject areas: reading, arithmetic, science, social science, literature, physical education, music, and art. In the junior high school, there should be a redirection of analysis and synthesis and a concentration of ekistics in four major cognitive-affective schemes. During the high school years, a full year's course in ekistics should be offered.

Cognitive-Affective Schemes at the Elementary School Level

On the following pages, cognitive-affective schemes and their supporting concepts are presented in an outline called a conceptual pathway. The concepts are defined, and a sampling of content and suggested performance objectives is given for each as a means of stimulating further thought and development. No attempt has been made to rank the various disciplines as to the importance of their contribution to the field of ekistics. For purposes of convenience, definitions have been assigned for Conceptual Pathway A, which emphasizes the sciences; for Pathway B, the social sciences; and for

Pathway C, the humanities. Level 6 in each pathway contains a synthesis of the three areas. The teacher is one person who plans all instructed learning, and it is only natural that a synthesis should be planned for each level. The definitions, thrusts, or probes are offered as guides to curriculum planners.

Conceptual Pathway A. Interdependence – In Interchange of Matter and Energy

Cognitive-affective scheme: Man is interdependent with his natural and physical environment.

The child just born is helpless. In effect, the infant, if it could embrace such a concept intellectually, would realize that at birth its very life depended on its close connection to its mother. The mother, in effect, nurtured the internal environment of her child. The external environment now mothers the infant and all living things. Man mothers his environment by his acts whether they be scientific, technical, social, political, or economic.

The organism is not an organism outside of the environment that gives it life. The organism is fitted to an environment, but not vice versa, because malfunction and malstructure may result. Thus, if lead or mercury is added to the environment in amounts sufficient to cross the critical threshold of radiation, organisms will die, whether salmon or man. If the supporting capacity of the land is exceeded, life will be destroyed.

Men are interdependent with more than the physical environment that gives them physical well-being; their mental and emotional life conditions their health as well. Wise nutrition is not the only requirement for health. Wise recreation, exercise, and rest are imperative as well. Interdependence (as a cognitive-affective scheme) then includes not only fitness of the physical environment, but fitness of the social environment, for man is interdependent with his total environment.

Pervasive Performance Objective

To understand man's interdependence with his environment. The children may demonstrate that they understand the basic principles that govern their physical interdependence with their environment. They can show how they use this information to promote personal and environmental health.

Level 1. In any environment, living things have similar needs.

Supporting Content

All organisms have the same general requirements: food, water, and oxygen for energy and adequate temperature and light.

The concept requires at least a first probe into man's nutritional needs. Probes can be made into the requirements for shelter in a variety of habitats such as wilderness, farm area, and urban or suburban centers.

Even in kindergarten the children can begin their journey along the conceptual pathway of interdependence.

Special Performance Objective

Observe similarity of self to other organisms. The children learn to care for classroom pets or plants. They can describe the care of a family pet or the needs of other living things.

Level 2. There are different environments, each with characteristic features and life.

Supporting Content

When observations are made of a body of water, wooded area, valley, marsh, or desert, one will see that they all have characteristic features.

Children can experience all of these environments. The experiences can be direct by means of a field trip or indirect through books, films, or television presentations. All these different kinds of experiences can help children develop concept-seeking and value-seeking.

When children are still very young, they can begin to appreciate man's dependence on green plants, although they may not yet grasp photosynthesis nor the lysis of water.

Special Performance Objective

Share a beginning understanding of the nature of different environments. The children can construct different environments – dry, moderate, or wet – in pots or terraria.

Level 3. Life and environment interchange matter and energy.

Supporting Content

Children can probe into the variety of ways in which organisms utilize the environment and, in so doing, modify it as they interchange matter and energy with the particular environment.

The children can observe earthworms feeding in soil and adding to it or plants growing from the soil and adding to it. Simple inquiries, whether purely descriptive or investigational, can furnish an evidential base. By planting seeds in an environment in which light is absent

ɪza-Borrego Desert State Park Calaveras Big Trees State Park

Children can probe the many ways organisms utilize the environment.

and comparing them with others treated the same way, except for the presence of variable light, the child will begin to understand the concept that green plants depend on light.

Special Performance Objective

Demonstrate the interchange of matter and energy. One child might design and carry out an investigation to determine whether minerals are necessary for the growth of a plant. Another might demonstrate the differences between humic and nonhumic soil.

> *Level 4. Life converts matter and energy into characteristic species form.*

Supporting Content

Rare is the child who does not wonder how the food he eats turns into more of him no matter what he eats. Soon he notices that this is true of all life; life is organized to convert matter and energy into

characteristic structure. This concept is supported by an investigation into the capture of sunlight by green plants. To understand the green plant as a prime producer is basic to the child's understanding of the simplest ecosystem or the complex planetary ecosystem.

When the child has learned that matter and energy are basic to the maintenance of life, he will begin to understand the relation of population to food supply or the importance of farming to his nation's economy.

The child can begin a first probe into the life of plankton and its significance to the world. He will see himself as interchanging matter and energy with the environment. Thus, another basis is developed for the child's understanding of his interdependence with his environment.

Special Performance Objective

Distinguish the food requirements of different organisms. The children can describe an adequate diet for humans or describe the requirements of different forms of plant life.

Level 5. The environment is and has been in constant change.

Supporting Content

Does the community change? Evidence of change is plentiful in every direction the child turns. An orange grove, a field, or a woodland disappears to make room for a freeway, shopping center, or factory. The child can see and feel the changes from one season to the next. The more subtle changes require the guidance of the teacher; these may be the changes in soil, the browning of a stream, the silting of a lake, the burning of a lawn, the beginnings of smog, or the dying of vegetation.

Special Performance Objective

Describe a variety of changes in the environment. A child might photograph desirable and undesirable changes in his environment and describe his reactions to these; or he might participate with a group in a conservation project.

Level 6. Man is the prime agent of change of the natural environment.

Supporting Content

The Indians and the early settlers met and lived most nearly in harmony with the environment, but they too altered it. As man moved westward, he began to exploit his environment and its natural

resources. Forests were cleared for farming. Beaver and fox were hunted for fur, and the buffalo were almost exterminated. Water was redirected for irrigation, and garbage was used for landfill. Although these actions have resulted in a high standard of living for most of our citizens, there is no question that they have also produced many unfortunate side effects such as water and air pollution, destruction of entire species of wildlife, and a loss of natural beauty.

Children, eleven and twelve years of age, can now appreciate the interrelationship of the sciences, social sciences, and humanities. They can relate the technology of the automobile to the social value of owning one. They can compare the beauty of the unsmogged environment with the deadly ugliness of the one fouled by the tons of pollutants spewed into the air.

Special Performance Objective

Evaluate environmental changes initiated by man. The children can keep their work area clean and help to decorate the classroom. They can describe the sources of potable water in the community and the methods being used to keep it unpolluted. They can analyze the sources of smog or other pollution.

Conceptual Pathway B. Interdependence – In Social Interaction

Cognitive-affective scheme: Man's social behavior is basic to maintaining, altering, adapting, or destroying the environment.

Which environments should be conserved? How should they be conserved? Who shall conserve them? The answers to these questions will depend upon man's concepts and values. With or without the intervention of man, the sequoia or trumpeter swan might well disappear. Man's intervention could hasten their destruction or contribute to their conservation.

Man pollutes the air, litters the landscape, and otherwise befouls his environment. He also preserves Muir Woods and takes action to preserve the beauty of San Francisco Bay. He has contributed to such problems as "population," "pollution," and "pesticides," and has built up a formidable list of endangered species. Nevertheless, he preserves historic sites and can, if he would, restore, replenish, and redeem the environment. Whether man develops a policy of zero population growth or not is a matter of values. The effort to "save" San Francisco Bay, recounted earlier, is undoubtedly an expression of the values held by enlightened community leaders. Values such as these are a part of the social sciences curriculum. This is not to say that the natural sciences are without values. Truth, open-mindedness, and humility are values respected by scientists and are a part of their community of discourse.

Pervasive Performance Objective

To understand the social interaction required to maintain a healthy and sanative environment. The children may demonstrate that they can maintain a healthy and sanative environment.

Level 1. Men live in different environments.

Supporting Content

Whether living in the mountains, in the desert, by the ocean, or in crowded urban centers, men have learned to adapt themselves to their surroundings. Their cultural components – for example, their art, religion, shelter, and language – remain constant, but their cultural forms are different. Thus, their modes of shelter are different. Through the study of geography, children learn that man can adjust to almost every kind of environment.

Special Performance Objective

Identify different human environments. The children can describe the different habitations required in arctic, torrid, and temperate climates.

Level 2. Men develop different modes of adaptation to life in different environments.

Supporting Content

Clearly, men have different customs in different environments. Their norms of behavior are different. The California Indians developed modes of adaptation that were different from those of the Northeast Indians. Western man makes use of his environment in ways that are different from those of the Hindu or African.

Over the world, man's cultural forms place demands on the environment. The seal is in danger in Canada, and another of the genus has disappeared from the Farallons.

Children enjoy probing the customs of different people throughout the world. They learn that, in all the diversity of human life, there is unity in cultural components. Only the forms and norms that men prize are different.

Special Performance Objective

Analyze different adaptations of men in their habitations. The children can build (from available materials) an igloo or cottage; or they can make models of dams, wells, or other forms of water supply.

Level 3. Men utilize the environment to secure their needs.

Supporting Content

Wherever man lives, he takes from the environment. He harvests his food from the land and sea. He mines the earth for its metals and other resources. He hunts for additional sources of power and energy for himself and his machines. The agronomists and geneticists who developed the high-yield rice hybrid IR-8 and the social scientists who assisted in introducing it into Vietnam and Indonesia are part of the socially oriented and technologically competent search for food.

A child might ask, "Where do I get what I need to live?" He will find that he, personally, produces little or nothing. He is interdependent with others for what he eats, what he wears, and what he uses for work and play. A child born in the United States will use 35 or more times the resources used by his counterpart in other countries. In terms of comparative resource use, the population of the United States is not 200,000,000, but 35 or more times that.

New developments in agriculture have increased the production of available farmland.

Special Performance Objectives

Identify and describe a variety of resource uses of man. The children can make models of a forest, ranch, or farm; they can draw or paint different food, plants, or animals; they can help plant a garden or window box at home or at school; or they can plant trees or shrubs.

Level 4. Men interact to utilize the world's available resources.

Supporting Content

Men communicate with each other, men transport each other's goods, men exchange goods and services, and men interact. Moreover, their interaction is global. Ships, trains, and planes fly the commercial routes of the world. The "have-not" nations depend on those who "have." Those who have food often feed those who do not. American wheat, rice, and corn are found throughout the world.

The fact remains that the world's resources are not adequate to feed the presently projected population growth. Just as men are interdependent, so are nations. Most nations are "have-nots" in terms of possessing adequate resources to maintain modern life. Even the United States does not have all the resources it requires.

Special Performance Objective

Identify the community's needs and sources of supply. A child might describe his family's contribution to the community; or he can describe his community's sources of food and other materials.

Level 5. Social aims determine the utilization of resources.

Supporting Content

Cultures and societies differ in their demands on the world's natural resources. The California Indians and the Spanish settlers lived in the same environment but had different ways of using it. The Massachusetts Indians and the Pilgrims had different uses for the natural resources that were available to them.

The religious customs of Hindus forbid them from eating their cattle. Americans breed cattle for food. Social aims determine whether wheat shall be hoarded, sold, or given to starving people. Whether or not a resource will be utilized depends on the technology of the nation as well as its social aims. Whether agricultural crops can be grown and harvested depends on a supply of labor. Whether water will be brought to an area depends somewhat on the economic resources of a city, state, or nation.

Special Performance Objective

Identify the rules and laws that determine the uses of resources in the community. The children can list the rules of behavior in the classroom or school area; observe town hall or city council meetings; participate in school government; or identify at least one law that affects the use of resources.

Level 6. Man modifies the environment in order to utilize his resources and to increase them.

Supporting Content

From muscle power to mechanical horsepower, man has increased the energy by which he utilizes his resources. Clearly, to continue living the good life, man's appetite for his resources will grow. The need for food, fiber, water, electricity, and transportation will increase as the population increases.

As man produces more food, he uses more pesticides and fertilizers. Fertilizer, washed into the water supply, hastens eutrophication; the inevitable growth of algae and of bacteria reduces the oxygen supply. Pesticides, concentrated in increasing percentage as animals feed on each other, result in a biological magnification which causes, in some cases, the death of the main predator in the food chain.

To increase the supply of the so-called nonrenewable resources, such as oils, metals, and nonmetals, man is ever on the hunt over the globe. Now he is turning to a probe of solar energy as a direct source of power.

Children at Level 6 begin to synthesize their concept-seeking and value-seeking. They begin to consolidate their experiences into a relatively mature awareness of the concepts and values that underlie the utilization of renewable, nonrenewable, and nonexhaustible resources. The children begin to focus on the role of human resources as advanced through education.

Special Performance Objective

Analyze the home and community environment and identify the social action underlying modification of the environment to utilize resources. The children can describe the basic nature of their community – agricultural, industrial, residential – and its past history. They can study the economic reasons for change in their environment. They can identify the decision-making agencies in the community. By becoming class representatives or members of a school organization, the children can participate in bringing about changes in the school environment.

Conceptual Pathway C. Interdependence – In Cultural Components and Forms

Cognitive-affective scheme: Man utilizes his symbolic and oral traditions to maintain or alter the environment.

Within this area of understanding, the child probes the bases for the appreciation of aesthetic beauty and order. Moreover, the child begins to probe his own values, using his own experience in science, social science, and technology. The objective is to develop an ethical construct of the environment. The conceptual area encompassed is that one referred to as the humanities, but it includes other modes of expression such as art, music, literature, drama, and photography.

Conservation became the cognitive-affective domain of first the naturalist and then the scientist. Gradually, man began to understand that he had to save not only the natural environment, but life itself, particularly its quality. The phrase "quality of life" traverses the cognitive-affective domain of ekistics. The social scientist, whether economist, political scientist, or sociologist, and the artist, whether painter, musician, writer, or dramatist, must help evolve the basic behaviors necessary to the establishment of a culture that will sustain a sanative environment.

Children build their own environment through writing, painting, singing, role playing, or just playing.

Pervasive Performance Objective

To understand the objects and events that are symbolic of aesthetic behavior. Children can demonstrate their understanding of the cultural components of their environment.

> *Level 1. Men interact mentally and emotionally to the objects and events in their environment.*

Supporting Content

At this level of understanding and activity, children probe the objects and events about them for the purpose of developing insights into the nature of beauty and its expression. Basic questions to be asked about an object or event in the environment might be: Why do you like it? Why don't you like it? Why do you think it is beautiful? Why do you think it is not beautiful?

Children may recite poetry, jingles, or their own "poetic" creations. They can explain, in their own words, why they like what they do. They can listen to other children's stories and poems, which will express tastes and styles different from their own. What do they enjoy? What music do they like? Which paintings do they like? Which poems do they like? Why? It is never too early to give children

an opportunity to develop a sense of beauty and style. Before this can happen, however, the teacher must have a good sense of beauty. What she does speaks so loudly that the children cannot hear what she says.

Special Performance Objective

Prefer environments that are sanative in nature. The children can discuss a television program or movie that was an expression of beauty; they can decorate the classroom with plants and pictures; or they may prefer to listen to stories, poems, or music about the environment.

Level 2. Men seek out objects, events, and behaviors symbolic of beauty.

Supporting Content

Within this area of understanding and activity, children actively begin to select objects, events, and behaviors they consider beautiful. Each child can become involved in a family or community effort to preserve something of beauty.

The performance objectives selected at Level 1 are enhanced in Level 2.

Special Performance Objective

Select objects that are symbolic of beauty. The children may choose an activity from the fields of art or music and explain the reasons for their choices. They may help decorate the school and classroom with pictures.

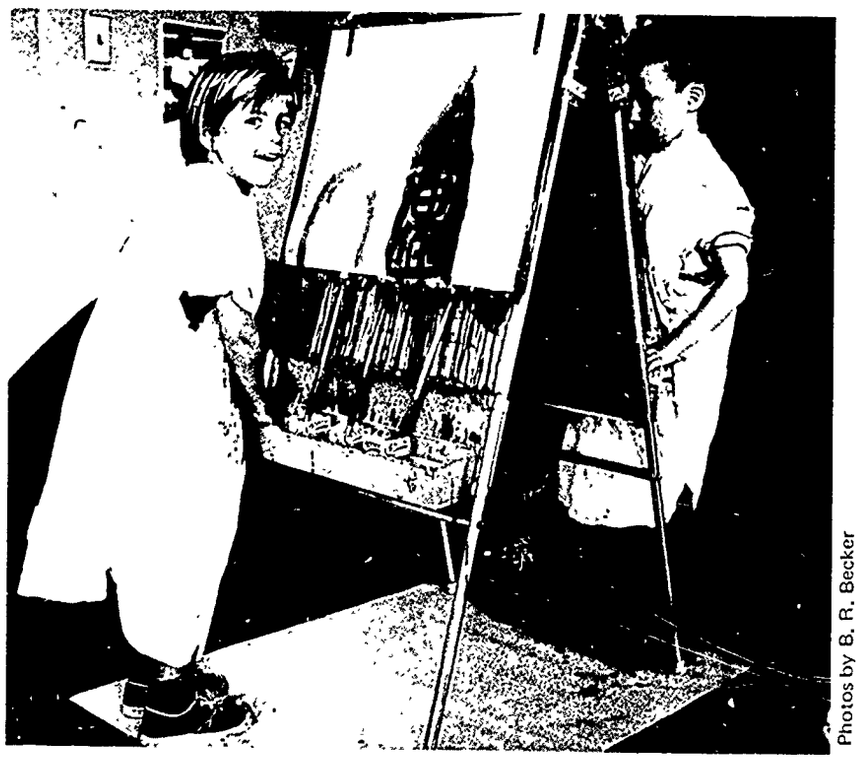
Level 3. Men, responding to special environments, create objects and events symbolic of their interaction.

Supporting Content

At this level of understanding and activity, children begin to increase their skills. Each child should have gained some effectiveness with at least one skill; it may be a skill in plant growing, painting, writing, or model making. This is just a beginning, but all efforts are beginnings. All children can learn to care for themselves and their own environment.

Special Performance Objective

Express ekistics through the crafts. Each child can use one of the crafts to express his need to beautify his surroundings.



Photos by B. R. Becker

Children can express ekistics through the arts and crafts.

Level 4. Cultures are characterized by their special ways of reacting to the environment.

Supporting Content

At this level of understanding and activity, children probe a variety of cultures which have interacted with the environment. They will learn that there are effective and noneffective ways of responding to the environment.

Whether one studies the history of the settlers of Jamestown or of the Spanish missionaries in San Diego, one finds a response to the environment.

The natural environment was ravaged from the all-too-rapid utilization of forest and prairie. Small settlements grew into gigantic cities virtually without planning. Today the cities are growing into megalopolises. New names such as La Fran, Chic Pitt, and Bowash are created in response to man's rampant technology and concentrating population. "Ghetto" and "urban slum" take on new meanings.

Yet there is beauty around us. Who is responsible for the environment? The citizens? The government? (In California, almost half the land is federally owned.) While children are still in school, they can probe at least two aspects: (1) how their own community cares for the environment; and (2) how "global" man, as viewed through the news media, cares for his environment.

Special Performance Objective

Identify cultural components and forms. The children can identify cultural components (e.g., music, art, or dance) of western and eastern cultures. The children can experience the various cultural forms of music, art, dance, drama, literature, film, or photography.

Level 5. Men create objects, events, and behaviors that nurture their images of beauty and order.

Supporting Content

Within this area of understanding, children study their environment to determine how their community creates events and behaviors that nurture images of beauty and order. Within Level 5, children examine a variety of cultures. On this concept level, children study the history of environmental care in the United States. Certain other periods of history are also selected for comparison and contrast. Thus, they probe the growth of population centers, from small settlements and villages to huge cities and conurbations. The children study the technological factors that made this growth possible. They study the efforts of environmentalists to conserve the

wilderness and the city. They begin to probe the ethics involved in ekistics.

Special Performance Objective

Create an object or event that is symbolic of beauty. The children collect pictures showing the good and bad aspects of their environment. They can show the use of color or design in painting pictures or arranging objects. The children can select records or poems that express their criteria of beauty. They can state their criteria of beauty and defend them.

Level 6. Men recreate their environment.

Supporting Content

Within this area of understanding and activity, children probe the present environment and create images of the future. The purpose of this effort is to focus on their developing ethic of ekistics.

At this sixth level of experience, at least two culminating and concentrating activities are recommended: (1) a week of outdoor experience (possibly in a school camp); and (2) a series of field trips into the community.

Children have shown that they can develop an ethic. Children, very early in this process, do make their goals, desires, and aspirations known.

Special Performance Objective

Act to conserve the environment. The children can join a conservation group in the community or help maintain the environment around their school. They can learn to express concepts and values that underlie ekistical behavior. The children might help set up a conservation display or write a report on an ecological project in their community.

Through such ekistical activities, the children can build a cognitive-affective base that will undergird further inquiring into the nature of the environment, its deprivation, its shortages, and the methods by which it can be redeemed and replenished.

A Curriculum Outline for the Junior High School

In the junior high school, it is appropriate to press forward with the cognitive-affective probes developed in the elementary years with a particular stress upon independent and personal inquiry into the environment. The skills of independence, as will be demonstrated, are based on the skills of interdependence. The junior high school student should have the opportunity to synthesize the information

pioneered by scientists and scholars. Students should learn early that the intellectual environment also relies on interdependence. Man ignores the mistakes of the past at his grave peril. Must man be doomed to repeat error? Must history repeat past calamity?

In the junior high school, most students can profit by the use of the skills of interdependence. They can do research in the library to check the findings they have gained through investigation.

Cognitive-Affective Scheme I

Societies perceive environmental issues of their time on the basis of past experience. Within this area of understanding and activity, students probe the concepts and values that were held by earlier societies. The purpose of this activity is to investigate the sources of the problems that affect present-day society, therefore, the content of this unit is primarily historical.

Was there a pollution problem in times past? Of course. Contaminated water spread the diseases of cholera and typhoid. The scientific discovery of the causes of diseases and the technological development underlying disease prevention and treatment surmounted these problems; however, another problem – growth of population – came into being.

Were there food shortages and famines in the past? Of course, but technology, based on agronomy, soil science, and genetics, overcame these difficulties, at least in Western cultures. Again, the conquest of shortages catalyzed the growth of population. When did the cities begin to "explode"? When did smog begin to appear? When did the wilderness begin to disappear? When did man begin to "worry" about natural resources?

The earth had one billion people in 1830; one billion more in 75 years; and one billion more in 35 years. Will this growth continue? Can technology overcome the pressures of population?

Cognitive-Affective Scheme II

The interaction of the culture with available technology determines the nature of the environment, which is planned and developed. Within this area of understanding and activity, students probe the relation of environment to particular cultures. The purpose here is to assess the aims of the students' culture in relation to their own environment.

What kind of environment sustained ancient man? When did man as food gatherer give way to man as grower? What kind of society was possible once man attained the technology that ensured a food supply during periods of shortage?

Did American Indians live in harmony with their environment? Did they try to adapt to the ways of the settlers and pioneers?

What happens when a culture with an advanced technology meets a primitive culture; e.g., the Dutch and English in South Africa or the Spaniards in southern California and Mexico? Can man continue to adapt to the growth of his technology?

The depth of the probe should, of course, be related to prior experience. Do boys and girls of thirteen, fourteen, and fifteen years of age have the experience? With the help of television, which presents many glaring examples of the impact of technology on society, these boys and girls certainly can probe these questions if final solutions are not required and imposed.

Cognitive-Affective Scheme III

Social issues and decisions alter the environment (emphasis on group). Within this area of understanding and activity, students probe some of the social decisions that have altered the environment. One can begin to probe almost anywhere in this domain.

Why do some families plant gardens? Why do some apartment dwellers have window boxes of flowering plants? Why do some families prefer country living?

The students may probe community-wide decisions. Why do some towns or cities encourage the influx of industry, whereas others have restrictive zoning laws? Why do some community groups participate in a "watch over the environment," whereas others do not?

Cognitive-Affective Scheme IV

Social issues and decisions determine the utilization of all resources (emphasis on political decisions involving government and legislative action). Within this area of understanding and activity, students continue the probe that was begun within the area of Cognitive-Affective Scheme III. The purpose here is to begin an initial probe into political decisions as they affect the utilization of renewable, nonrenewable, and nonexhaustible resources.

The probe can begin with issues and decisions that involve the individual or family. What are the values that are considered in making a purchase? Why does one student buy a package of seeds while another buys a ticket to the movies? What are the reasons behind family decisions concerning clothing, vacations, outings, or entertainment? Other decisions involve the entire community. Where does a city get money for schools, for parks, for tree planting? Where does a city get money for slum clearance? Who makes the decisions? Who does the planning on the use of municipal funds? Is there a city

planning commission? Is there a conservation commission? Why? Why not? Who decides on the expenditure of municipal funds? Does a citizen have any part in the decision? How? When?

In the junior high school, the individual student is encouraged to probe on his own. The student should begin to think about his initial career decision. Most decisions on future vocations are made before the age of fifteen in terms of the kinds of work to be pursued in high school. The decisions made during these years will greatly influence the ability of the student to reach his full potential.

Special Performance Objectives for the Junior High School

Probe the technology presently available in relation to its effect on the environment. The students may investigate the nature of combustion, methods of transportation, or methods of waste disposal to determine the kind of personal or group action that might be taken to ameliorate the unpleasant effects of modern technology.

Probe the efforts made by the community to solve its ekistical problems. Students may inquire into and report on the present condition of the community's environment. They may analyze the efforts made by the news media, local governing council, or state legislative body to promote a sanative environment. The students may describe the role of the citizen in maintaining an ekistical action plan.

A Curriculum Outline for the High School

Now more than ever, young men and women should be offered a course in ekistics. The concepts and values that make up the domain of a course in ekistics have a demonstrable impact on thought and action.

The term *course* implies daily concentration. Nevertheless, with the modular plan now a part of many high schools, the course may be part of a quarter, trimester, semester, or year. When the instruction is nongraded, the course may have a time sequence that is based on the application of each student.

Ekistics is more than a laboratory or field course. The entire community is the field of study. Furthermore, ekistics involves problems that are of vital concern to individuals, families, and communities.

Cognitive-Affective Scheme I

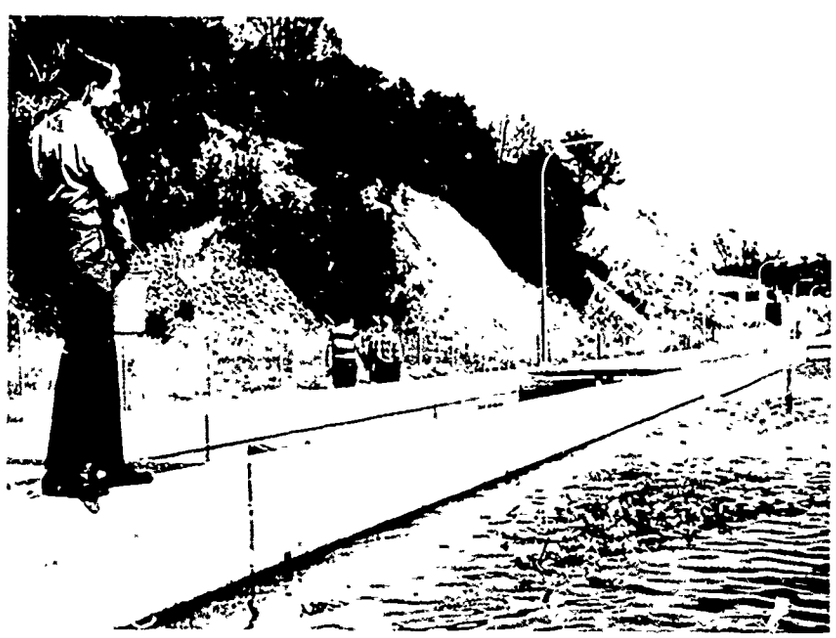
In any given environment, organisms are linked within an ecosystem. Within this area of understanding and activity, students probe the delicate interrelationships of organisms in their environ-

ment. Their purpose is to determine the kind of dynamic balance in which organisms exist and how easily this balance is upset.

Organisms can be seen to survive within an ecosystem, whether in an aquarium, pond, ocean, forest, or decaying tree trunk. The ecosystem consists of all the physical and biological conditions that support organisms living interdependently. An ecosystem can be as large as the world if we consider man as interdependent with his resources over the globe.

In the field students may see the delicate but dynamic balance in which an ecosystem is able to maintain itself intact. A pesticide, by affecting essential food organisms in a particular niche, may affect the entire ecosystem. Thus mercury in plankton can become concentrated in successive food organisms in a food web of algae, shrimp, small fish, large fish, and largest fish; the predator at the end of the link may suffer the effects. Students thus become aware of biological magnification. Similarly, eutrophication destroys ecosystems by a massive overnutrition. Each student probes his interdependency within his own ecosystem and learns the importance of photosynthesis and the oxygen produced by the ocean's plankton (more than 50 percent of the world's supply).

The students can probe man's dependence on his renewable resources such as farming, forestry, and fisheries. They might ponder



Efforts are being made to renew the natural resources.

The mountain sheep is adapted to its own special environment.

the meaning of the increase in the greenhouse effect and the growth of population in relation to the food supply.

The environment that is available to an organism is limited. Further, for any species, the organism is adapted to a special environment and serves a particular ecological niche; and, in all probability, no two species occupy the same ecological niche. The students begin to learn why man, of all organisms, is the dominant but unreliable factor in the world ecosystem.

The students have now begun, on the basis of their experience in ekistics in the elementary and junior high schools, to synthesize a system of concepts and values with which they can probe their environment with intelligence and compassion.

Cognitive-Affective Scheme II

Issues and decisions affecting the world ecosystem reflect the pressure of population upon resources. With a basic understanding of man's interrelationship with other organisms, students can probe the causes of imbalance between organisms. Within this area of understanding and action, students probe the effects of an increasing population upon the environment. Their objective is to develop for themselves an insight into the nature of the problem. Barring disaster, there will be four billion people on earth by 1975. If the current rate of population growth continues, the world population will double in another 35 years.

To understand the nature of population pressure, the students study demographic data and begin to understand the dynamic forces

that underlie the "rate of natural increase." The students can compare the annual population increase for the United States of 0.77 percent with a world increase of 2 percent. How does man increase or decrease the population? Can all the people be fed and housed? Can the quality of life remain favorable?

The students begin to correlate improvements in the technology of health and nutrition with the increase in population. They analyze the effects of urbanization and distribution of population. They study projected changes in density and distribution. They probe the relationship of the limits of population as related to the limited resources of the earth. They consider such questions as the following: Will there be enough food or space? Are we likely to run out of useful concentrations of metals before we run out of food? Are we to extend our food-growing areas at the expense of environmental beauty and amenities? Finally, the students and all educated men and women must ask themselves: What kind of a world do we want for ourselves, our children, and our children's children?

Cognitive-Affective Scheme III

Wise utilization of the environment is dependent on the organization of shortage. On the basis of prior experience in concept-seeking and value-seeking in the elementary and junior high schools and the preceding probes in ekistics, the students should now be able to understand the meaning of shortage.

Within this area of understanding and action, the students explore the limits of the earth's environment to furnish the resources for modern and future life and living.

The students probe the utilization of fossil fuel, hydroelectric power, atomic energy, and solar energy as sources of power. They probe the practicality of geothermal and tidal power. They explore the limits of the earth's production of power. They probe the distribution of the world's mineral resources – coal, oil, copper, iron, zinc, and phosphate – and of the so-called "mineral vitamins," such as molybdenum and tungsten. They learn that the United States is a have-not nation as far as these metals are concerned. This nation's technology would not survive without them.

As the students probe man's dependence on his renewable and nonrenewable resources, they arrive at more questions such as the following: Can we plan to organize our shortages for the highest quality of life? Does planning reduce our freedom to act as individuals? What does wise utilization mean?

Cognitive-Affective Scheme IV

The concepts and values man accepts as guides to his future behavior determine the quality of his life, if not his survival. The students now engage in probing their own concepts and values with regard to the environment. Within this area of understanding and action, the students probe the concepts and values that are basic to the development of a sanative environment. They can discuss the statement by René Dubos that "quiet, privacy, independence, initiative, and open space are real biological necessities, not frills or luxuries." The students probe the concepts and values required to maintain and sustain the diversities that support the "spiritual potentialities of mankind."

The students can begin with questions such as: Can we have "pure" air and high industrial activity? Do we require a resources policy? Do we need a population policy? Should we have an Environmental Bill of Rights? What social, economic, and political policies must we pursue to provide a reasonable assurance of a healthy and sanative environment for the future?

The students soon learn that, while there is consensus on a need for policy and some agreement on the policy, there is lack of consensus about how the policy is to be carried out. They are, however, on the road to a resolution of the conflict because they are facing the roots of the conflict. The students can then probe the differences between value systems. Can Americans continue to utilize 35 percent of the world's resources? Should they? Should Americans feed the famine-struck nations? Can they?

Performance Objectives for the High School

Pervasive Performance Objective

To probe specific ecosystems and the planetary ecosystem to determine the concepts and values on which survival of life depends. Students analyze and synthesize prior ekistical experience into concepts and values. These concepts and values should form a base for student action in promoting a sanative environment. The students may study the major ecological problems that affect the ecosystem — pollution and population. They might analyze the pressures on resources and the organization of shortage to determine their personal or group action to relieve any ecological problems.

Special Performance Objectives

Develop an ekistical base for analyzing deprivation of the ecosystem. The students might look for signs of deprivation in the

ecosystem. They can then analyze different methods of ameliorating the areas of deprivation and restoring the balance through appropriate use of technology. They can investigate technological devices that have been offered as solutions for some ecological problems; e.g., introduction of ways to develop viable plans for housing, zoning, and so forth.

Probe technological and social devices that can be used in analyzing the organization of shortage. The students may probe the nature of have and have-not nations, particularly in relation to food, fiber, and metals. Does each individual have a personal and group responsibility to maintain the United States in a state of economic health relative to maintaining a sanative environment? What are the concepts and values to be utilized in maintaining a healthful environment?

Determine the ekistical conditions that have resulted in a list of "endangered species." Students can inquire into the validity of the addition of the last-named species to the following list of endangered mammalian species.

Rare and Endangered Mammals of the United States[1]

Mammal	*Status*	*Reason for decline*
1. Indiana bat	Endangered	Commercialization of caves in Indiana; vandals; insecticide poisoning
2. Utah prairie dog	Endangered	Disease; suppression because of history of infection with sylvatic plague
3. Kaibab squirrel	Rare	Automobile traffic; disease
4. Delmarva Peninsula fox squirrel	Endangered	Disruption of habitat through timber cutting, construction, and road building; hunting for food and sport
5. Eastern timber wolf	Endangered	Heavy hunting and trapping pressure for bounty; encroachment of civilization

[1]The list of 25 species was compiled by Michael P. Dumont, Curator, Mammalogy, American Museum of Natural History. The authors have added, with deep concern, a twenty-sixth, which is possibly endangered.

Mammal	*Status*	*Reason for decline*
6. Texas red wolf	Endangered	Heavy trapping and hunting pressures; inability to compete with more aggressive coyote
7. San Joaquin kit fox	Endangered	Reduction of habitat; highly susceptible to rodenticides that have been widely used in area; excessive hunting
8. Glacier bear	Rare	Overhunting as a curio; about 500 existing today
9. Black-footed ferret	Almost extinct	Poisoning directed at rodents; elimination of natural prey and den holes
10. Southern sea otter	Rare; once nearly extinct	Slaughtered for furs in latter half of eighteenth century; absent off coasts of Washington and Oregon since 1876; now being molested by abalone fishermen off California
11. Florida panther	Endangered	Heavy trapping and hunting pressures; pressures of civilization

The California sea otter is now protected by international law.

Mammal	*Status*	*Reason for decline*
12. Caribbean monk seal	Endangered; may be extinct	Indiscriminately slain since early Spanish days
13. Guadalupe fur seal	Endangered; slowly increasing	Sealing in the 1880s; once believed extinct
14. Florida manatee or Florida sea cow	Endangered	Hunting for flesh, oil, and skins; wanton slaughter for sport; silting of coastal feeding grounds
15. Key deer	Endangered; slowly increasing	Development and occupation of islands by man
16. Columbian white-tailed deer	Endangered	Loss of habitat; bottom lands being cleared
17. Sonoran prong-horn	Endangered	Competition by domestic cattle and horses; overshooting and poaching
	Peripheral species may not be endangered everywhere; their survival as part of the fauna of the United States is a matter of concern.	
18. Coatimundi or Chula		
19. Jaguar		
20. Jaguarundi		
21. Ocelot	Critical in Mexico	Brush habitat cleared; pelts sold as curios
22. Margay	Exceedingly rare	
23. Woodland caribou		
24. Mountain caribou		
25. Musk-ox		
26. Man		

Chapter 3

Instruction and Teaching

When valid research on instruction is available, teachers are bound by it. But with or without research, teachers must teach, and styles and methods of teaching are personal inventions.

Currently, it is fashionable to speak of teaching through inquiry and sometimes of learning as synonymous with inquiry. One speaks of processes of inquiry. Schwab, probing into "process," cautions thus: "Inquiry is far from being a universal logic. On the contrary, it is only a generic envelope for a plurality of concrete inquiries. Each one arises in relation to a specific subject matter, and the essence of each lies in its own substantive conceptions, its own data, and its own questions asked and answered."[1] Perhaps it would be more appropriate to speak of an "inquiry into," not of teaching through inquiry. Inquiries are concrete. One inquires into something.

Instructed Learning and Experience in Search of Meaning

Those of us who teach need a theory of teaching that will embrace ever new terminologies, whether inquiry or process or discovery. Observations of what happens in a school have been confused with what happens when children learn. Actually, what is being observed is what children are learning when they are taught.

But learning per se is greater than schooling, and education is greater than teaching. In the process of learning, one is not limited to what happens in school. School is mainly concerned with instructed learning. Instructed learning is critically different from learning per se in both strategy and tactics.

Strategy for Instructed Learning

A strategy developed for instructed learning is based on the following premises:

1. Instructed learning involves not only learning, but instruction; hence, instructed learning. Instruction involves teachers as well as students.

[1] Joseph J. Schwab and P. F. Brandwein, *The Teaching of Science.* Cambridge, Mass.: Harvard University Press, 1962.

2. Instructed learning is based on nonrandomized experience; that is, selected experience, often segmental experience. This is to be compared and contrasted with learning that is based on random experience. Often this is the kind of learning that is based on individual experience outside of school.
3. Instructed learning implies curriculum and instruction, as well as materials of instruction and a formal evaluation of success in instruction.
4. Instructed learning presupposes not only nonrandomized experience, but experience in search of meaning or structure.
5. Instructed learning presupposes a plan of instruction or a curriculum. The curriculum developed here is based on structures or constructs commonly called concepts. The web of concepts within their conceptual pathways constitutes the structure of a curriculum for ekistics.

Tactics of Instruction

Once a curriculum undergirding instructed learning in ekistics is constructed, the tactics of instruction can be developed. Bruner emphasizes that "insofar as possible, a method of instruction should have the objective of leading the child to discover for himself."[2] But it is utter nonsense to assume that this means that the child should discover everything for himself. Expertness in teaching has its constraints. Above all, an expert shows restraint.

Insofar as possible, the strategy of ekistics is to furnish opportunity for the learner to uncover as well as discover structure for himself.

Curriculum and Instruction: The Marriage of Concept and Process

A theory of teaching that powers the quest for a suitable form of instruction for ekistics may be stated as follows:

> In any specified act of teaching, a new environment is created; in responding to the changed environment a learner gains capacities not achieved through prior experience but specified in the aims of the act of teaching.[3]

Instruction is concerned with creating for the child a new environment to which he can respond. This response helps the teacher determine what cognitive-affective frame of reference the

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[2]Jerome S. Bruner, *Process of Education.* Cambridge, Mass.: Harvard University Press, 1960; *On Knowing – Essays for the Left Hand.* Cambridge, Mass.: Harvard University Press, Belknap Press, 1962; *Toward a Theory of Instruction.* Cambridge, Mass.: Harvard University Press, Belknap Press, 1966.

[3]Paul F. Brandwein, *Notes Toward a General Theory of Teaching.* New York: Harcourt Brace Jovanovich, Inc., 1966.

child brings to the act of learning. The teacher can then revise the tactics of instruction if the child's prior experience has been overestimated or underestimated. A determination can be made whether a change in behavior has been achieved or whether a new environment should be created to promote the growth of the child.

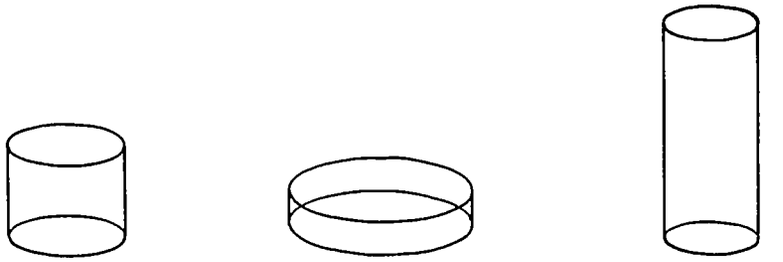
A child may draw a mouse as follows:

This child is not an artist, but he is expressing himself in line and form. He is a child learning; however, the teacher must provide opportunity for the child to fulfill his powers of pursuit of excellence.

Concept-Seeking

A child is not endangered by his early probes in concept-seeking. Children who have had experience with the concept of interdependence in the first, second, and third conceptual levels of schooling have more easily come to an understanding of the effect of pollution on independence.

Further, the mode of instruction is significant in concept attainment. If the children are permitted first to probe, then to do, they will more easily undo their prior concepts and insights. For example, the following concept can be accepted on the basis of experience: A quantity of water will maintain its essential volume when it is poured into different containers.



Container (1) Container (2) Container (3)

Yet, children described by Piaget verbally expressed their concept that container (3) had more water in it than either container (1) or (2).

When instruction is included as part of the investigation, the results are different. For example, the following learning experience is a form of instructed learning.

Learning Experience

A six-year-old child is given a glass-marking pencil and asked to mark the top of the liquid in container (1). He then is asked to pour the liquid into the taller container and to mark the top of the liquid. When told to pour the liquid back into container (1), the child discovers that the liquid goes up to the original mark. Now when asked, "If you were to pour the liquid into the tall jar, would there be more, less, or the same?" He responds, "The same." The child cites the observation that the liquid goes up to the mark he made. He associates the concept with a significant operation.

If children are given the opportunity to become apprentices in investigation and to gain experience in search of meaning, they will acquire the legacy of cumulative knowledge and a way of gaining new knowledge. For the unknown is sought best by those who have experience with the known. Guided by the teacher, the children will have time to develop without being penalized for error. For learning consists in the amelioration and circumvention of error. Learning is an art of intelligent failure; that is, as one learns, one reduces errors and grows.

Given these experiences without hurry, with freedom to err, with freedom to try again, and without an atmosphere of coercion or threat, then most children in the first grade are not confused by the variety of containers. They now understand that the amount of water does not change. They have begun to move along a conceptual pathway.

This is not to say that all children are able to apply their concept-seed to the concept. Matter is conserved; or, in a physical change, the amount of matter is constant.

If the style of instruction gives the child an opportunity to do, rather than to watch and listen, then the child rapidly gains in concept-seeking and concept-forming. Doing also means reading, listening at appropriate moments, and questioning. It means using all the materials of instruction: text, laboratory, audiovisual aid, and field trip. It means using all appropriate human resources, including the teacher. The child himself furnishes the energy for doing, and the teacher refrains from telling.

In the preceding investigation, when experiences were progressively enlarged, the children were able to apply the insight gained from their earlier experiences. Of course, this was in conjunction with

their vicarious experience gained through television. For example, at Level 3, assuming greater experience at each level, children could visualize that a ball of clay made into a small statue would not gain or lose weight. A sink of water transferred to a bathtub would be "flatter," but would not be "less." A bathtub of water transferred to a sink would overflow, but would not be "more."

In Search of Meaning

What effect would a greater facility in linguistic and semantic usage have on concept-seeking, concept-seeding, and concept-forming?

All of this may seem to be a roundabout, even unnecessary, way pressing the obvious: As children search for meaning, the richer the more varied their early experience is, the sooner they will s the conceptual boundary. But, experience in search of meaning lies, in turn, a curriculum organized to reinforce the child's prior ...ncept-seeking, to reward it, and to build upon it. A teacher in the later grades not only inherits a child who is older in years, but she should inherit, if the intellectual environment of the school is structured, a child further along the conceptual pathway. And, if each child is considered of supreme moral worth, that is, if the school environment is also one of constructive affection, then the child will in time be ready to cross the conceptual boundary. Suddenly, when the child has crossed it, it is as if the world has become clearer. Investigations have associated this crossing with the period of the third level – about eight to nine years of age; however, this depends on the child's prior experience along a conceptual pathway. For example, in any investigation, a child who has the random experiences associated with a topical curriculum does not seem to be able to cross the conceptual boundary at the same time as does a child who has had an environment of nonrandomized, concept-seeking activity. This assumes, of course, that the experience is not confined to the curriculum, but involves the child's total environment.

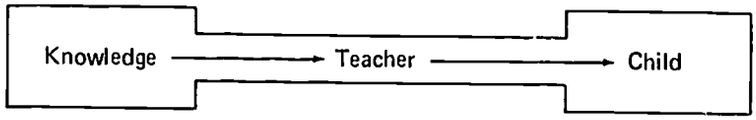
We would insist, however, that there is no correct level of performance that corresponds with a given grade. A child in the act of communication is neither right nor wrong; he is developing. As he gains experience and knowledge and the insight based on continued concept-seeking and value-seeking, he is able to function better intuitively.

A painter learns to paint by painting and by instruction. A scientist learns to inquire by investigation and by instruction. He learns to consolidate and pioneer. An ekistician probes the environment and, in so probing, builds his discipline.

Learning Environment

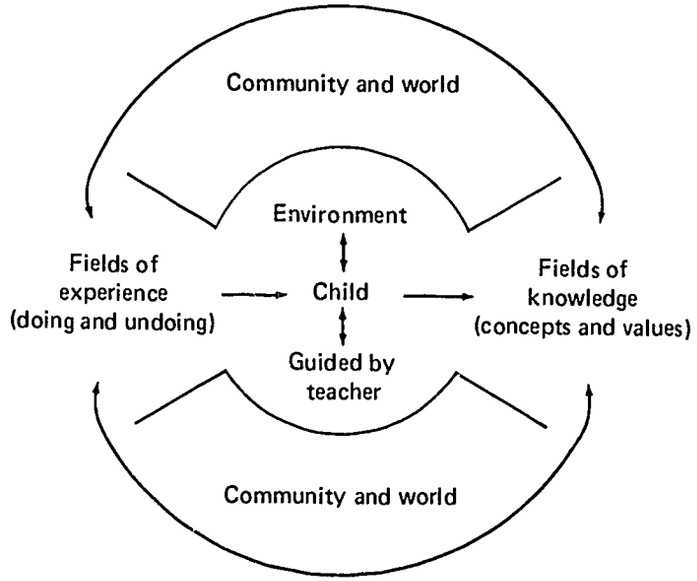
The purpose of instruction is to facilitate learning, and it is the child who is the learner. It is he who must do and undo. Nevertheless, in instructed learning, the teacher, a team of teachers, or a curriculum creates the environment for learning. This environment must be a sanative environment if the child is to learn; and it is only through the child's activity that the teacher will know the child is learning.

In any act of teaching, a teacher creates a new environment out of the elements of common experience. In responding to the changed environment or in creating a modified environment of his own, the learner gains capacities not developed as a result of prior experience or teaching.



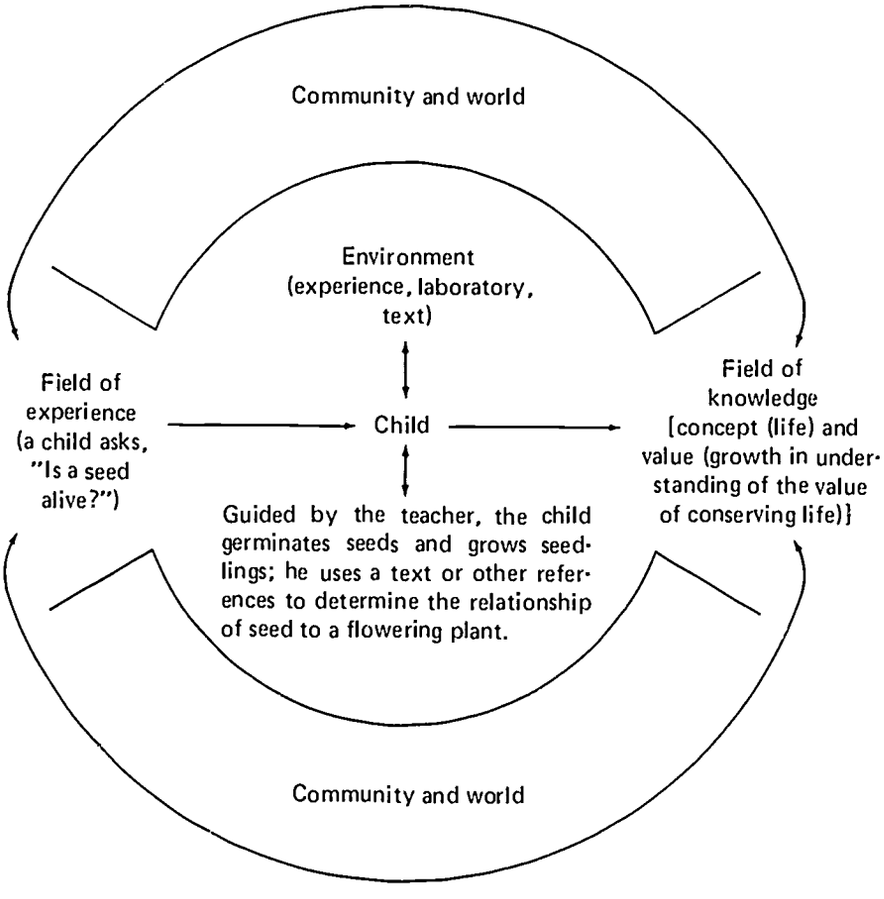
In this model of instruction, the teacher is a conveyor. The teacher conveys knowledge to the children. The children absorb and memorize. At examination time, they demonstrate what they have learned from the presentation, books, or other aids they have used.

Another system of instruction would seem more appropriate. This system is not closed but open. It is a system that takes advantage of all the resources of the community as well as all the abilities of the children. This concept of instruction can be illustrated as follows:



Experience feeds knowledge, and knowledge feeds experience; the known feeds the unknown, and the unknown catalyzes knowing. The cycle is continuous. The teacher is a guide, not the guardian of the archives.

For example, a text may be used creatively as a "field of experience," within the context of the model, as in the following illustration:



Nevertheless, it is of the utmost significance to emphasize two aspects of instruction, which seem to have been ignored by those of us who have pressed for doing by the child (as we have here) and by those who have stressed "inquiry approaches." It is our view, supported by extensive work, that discovery does not proceed in a "flash." The "flash" of insight is based on prior knowledge.

The educational system diagrammed here has existed for many years in most kindergartens and in most graduate schools within the

university. Less than two years ago, it existed in most primary schools, less so in intermediate schools, less so in junior high schools, less so in high schools, and least in colleges.[4] Over the nation, the modes of instruction are opening. Today instruction is turning from the system of conveying the archives to the child to a system in which the child conveys his powers to the ardent pursuit of his various excellences. Ardent is the word; the teacher motivates what is ardent in the individual child.

In such a system, a child can and should learn in all ways – by voice, by book, by machine, by investigation, but above all, by example. A teacher cannot be replaced; a lecturer can. A machine can do as well as most lecturers. Of course, the brilliant lecturer conveys not mainly his subject, but himself. A teacher is larger than life when she encompasses the lives of children. Education remains the single voyage of the child; it is synonymous with growth.

In reflecting on the modes of instruction, we have been answering in part the all-important question: What kind of a world do we want to live in?

Man has survived because he has been able to build a better world for his children. In spite of the absurdities and contradictions of life, man has retained this franchise of humanity. Thus, he has survived uncounted plagues, devastations, famines, and wars. Thus, too, he will redeem the environment.

Encouraging Change in Behavior

The concept of instruction described here has long been supported by theorists and practitioners of the teaching art. Specifically, a student's "learning" is known by his response; that is, by his behavior. Producing a change in behavior is synonymous with education. In ekistics, as previously stated, the aim is to produce those changes in human concepts and values that result in behavior that will demonstrate the following:

1. Recognition, in word and deed, by the student that he is interdependent with his environment
2. Evidence, by word and deed, that the student supports a culture that will sustain a healthy and sanative environment

Perhaps a lesson-cluster plan can be developed that is centered on the response of the learner to the instruction. Many creative teachers spurn lesson plans, but all creative teachers plan. Whether or not

[4]We have observed school systems in the United States which use nongraded systems to give the child full opportunity, but we are not speaking of nongraded systems per se. All school systems can make use of what is already known to develop a system in which the child can fulfill his individual powers in pursuit of his excellence.

teachers use this form is of little concern. The objectives embraced by the form are, however, worthy of emphasis, as follows:

1. To center on the response or behavior of the learner
2. To encourage a change in behavior
3. To encourage a change in instructional practice from emphasis on presentation by the teacher to performance by the learner

Thus, wherever school administrators find it convenient to institute nongraded instruction, then the lesson cluster may be useful as an individualized learning activity package (LAP). The lesson plan has been written in such a way that it may be used by the learner. On the other hand, where the administrative plan is to utilize a graded system, the lesson cluster may be used primarily by the teacher. Or, if the teacher wishes, the lesson plan may still be used as an assignment for individuals or groups. Two lesson clusters are presented here; one is a plan for a science project, and the other is an outline of a plan for a social science project.

A Plan for a Lesson Cluster in Ekistics
Conceptual Scheme: Interdependence

The objective of this lesson cluster is to determine whether or not fertilizers are pollutants.

Cognitive-Affective Scheme

In any given environment, organisms are linked within an ecosystem.

Performance Objectives

Concept-seeking. The students probe into the validity of the following generalization: Fertilizers replenish the soil.

Value-seeking. The students probe into the value of the practice of using fertilizers.

Methods of Intelligence

The students observe action of fertilizers, investigate their use, and hypothesize the effect of fertilizers on the environment.

An initial probe. Perhaps a team of researchers might set up an investigation to determine the effect of a fertilizer. (The fertilizer might be a liquid fertilizer that is used for household plants.)

Five radish seeds are planted ¼ inch deep in each of ten paper cups containing vermiculite or washed sand. Five of the cups are watered with the fertilizer solution; the other five should be controls (i.e., no fertilizer solution). Holes should be made in the bottoms of the cups to drain off the water. Which plants show better growth? Why?

Two large glass jars are filled half way with pond or aquarium water. An equal number of water plants are placed in each jar. A netting is placed over each jar. The five cups to which fertilizer has been added are placed on one netting. The controls are placed on the other netting. They are watered as before. What is your hypothesis on the growth of the water plants? Is your hypothesis supported by the evidence?

A continuing probe. The preceding investigation will take time. During the investigation, while observations are being made, various types of research might be useful. On the basis of the research, what might be the effect on the water plants that received fertilizer? What observations might be necessary to determine whether the effect is that of the fertilizer or some other factor?

Further study. By using a map of California, the students can locate an agricultural area near a lake or a river that flows into the ocean. What would happen if rains fell after the fields were fertilized? What might happen to the growth of the plants in the lake or ocean?

The students can design an investigation to support or disprove the original hypothesis. Is another hypothesis required?

Probes into personal behavior. Some tentative conclusions on the basis of all probes, experiments, and observations may have been reached. What does the collected information suggest about the following:

1. Does the food you eat have any effect on your growth? How do you know?
2. Does a substance like alcohol (taken into the body) have an effect on behavior? How do you know?
3. Do drugs have an effect on behavior? Which drugs?
4. Substances (fertilizers and pesticides) affect the growth of plants. Do substances (food and drugs) affect the growth of the body?
5. The effect of harmful substances on the rivers and oceans (external environment) may be called external pollution. The effect of harmful substances on the body (internal environment) may be called internal pollution. What evidence is there in the community in which you live of (1) external pollution; and (2) internal pollution?

Performance in concept-seeking. The students have an increased understanding of the pollution effects of substances on the environment. The effects of pollution can be identified. The harmful effects of fertilizers and pesticides are explained and balanced against their beneficial effects. Newspaper and magazine articles are analyzed to

determine the possible effects of pollutants on external and internal environments.

Performance in value-seeking. The students take positions on the use of the following:

1. Tobacco
2. Drugs
3. Pesticides
4. Fertilizers

Performance

Smoking has decreased among some students. The students can now understand the effects of smoking. They can explain the effects of drugs on the body and probe their own behavior. They encourage their parents to purchase detergents that are biodegradable.

An Outline for a Lesson Cluster in the Social Sciences (Level 6)

The objective of this lesson cluster is to observe erosion in the city.

Instructional Objectives

1. Concept-seeking (city as habitat and habitation)
2. Value-seeking (comparing beauty with ugliness)
3. Methods of intelligence (observation and analysis)

Probes. With photos, drawings, stories, or poems, children analyze their community to determine the desirability of living there.

Performance Objectives

Children act to beautify the environment of the school. They decorate the classroom and clean up the surrounding area. Parents report change of behavior at home.

Response by Learner

Lesson clusters are plans for encouraging a response to a learning situation by the students. The students give evidence of learning by their activity. In the two lesson clusters the behaviors in consolidation of learning (acquiring) and pioneering of learning (inquiring) have clearly shown that the emphasis is on change of behavior. Each lesson cluster has its performance objectives. These objectives may be shown to be attained through a change in conceptual behavior; that is, understanding (recall, explanation, analysis, and synthesis) or valuing (prizing desirable rather than undesirable ends). The attainment of concepts and values, however, must be demonstrated by some sort of action.

Conclusion

An effort has been made to sketch the outlines of an elementary through high school interdisciplinary curriculum. This curriculum should help students understand their physical, social, and cultural interaction with the environment in order that they may develop and maintain a culture that will sustain a healthy environment. This effort represents one important step between legislative mandate and an effective classroom program. The local school administrator and teacher must complete the process by developing a curriculum that is suited to the needs of the community and the students they serve. Educators are equal to the challenge, and they represent the one agency of society that can turn environmental concern into constructive action. In order to meet this challenge, educators must keep in mind the following ekistical goals:

- To live in harmony with the environment
- To use the natural resources wisely
- To maintain a culture that cherishes the beauty of life

Appendix

Suggested Learning Experiences Developed by the Los Angeles City Unified School District for the Elementary Ekistics Framework

INTERACTIVE CONCEPTS FOR LEVEL 1

Pathway A Interdependence – In Interchange of Matter and Energy	Pathway B Interdependence – In Social Interaction	Pathway C Interdependence – In Cultural Components and Forms
Level 1. In any environment, living things have similar needs. 1. Green plants, growing in sunlight, make the food they need. 2. Animals need green plants for food. 3. Man needs plants for food. 4. Plants need sun, minerals in the soil, air, and water. 5. Animals need food, air, and water (also exercise and sleep). 6. Most plants are dispersed in the environment by seeds. 7. Animals are alike in many ways.	Level 1. Men live in different environments. 1. Man needs food, sleep, shelter, and clothes. 2. A family can provide each individual with these necessities; however, this task is made easier when families share with the community. 3. Members of a family help each other. 4. Families depend on the help and talents of others in the community. 5. Man adapts himself to many different environments.	Level 1. Men interact mentally and emotionally to the objects and events in their environment. 1. Beauty is a matter of personal opinion. Man develops his own criteria for beauty from the things he sees in his own environment. 2. Feelings about environment may be expressed through art, music, dance, literature, or drama. 3. Man creates works of art that evoke happiness, sadness, anger, or fear. 4. Visual representations of local environment evoke feelings that may lead to community action concerning the environment.

INTERACTIVE CONCEPTS FOR LEVEL 2

Pathway A Interdependence -- In Interchange of Matter and Energy	Pathway B Interdependence – In Social Interaction	Pathway C Interdependence – In Cultural Components and Forms
Level 2. There are different environments, each with characteristic features and life.	Level 2. Men develop different modes of adaptation to life in different environments.	Level 2. Men seek out objects, events, and behaviors symbolic of beauty.
1. Plants and animals can live and grow only where their requirements for food, water, air, and sunlight are met.	1. Many people in tropical zones hunt and gather food in their immediate surroundings.	1. Exploration of local environment can lead to a collection of beautiful (and ugly) objects.
2. Living things make up communities.	2. People in tropical zones often wear light clothing and construct houses that are open to the surroundings because keeping warm is not a problem.	2. Pleasant environments may be created by adding or subtracting items.
3. Certain plants and animals are found together in communities.	3. People in tropical zones often use the raw materials found in their immediate environment to build houses and tools.	3. Noise is a form of pollution that can be reduced through community effort.
4. The city is a community where people live and work alongside one another.	4. Men living in modern cities are able to modify their environment in many ways.	4. Discarded objects may have artistic potential in the form of "junk" art.
5. In the city community some animals and plants are cared for by people.		

INTERACTIVE CONCEPTS FOR LEVEL 3

Pathway A Interdependence – In Interchange of Matter and Energy	Pathway B Interdependence – In Social Interaction	Pathway C Interdependence – In Cultural Components and Forms
Level 3. Life and environment interchange matter and energy.	Level 3. Men utilize the environment to secure their needs.	Level 3. Men, responding to special environments, create objects and events symbolic of their interaction.
1. Man consumes plants and animals.	1. Wherever man lives he harvests natural resources, which may not replenish themselves.	1. Man's many relationships between his goals and his creative results may be viewed through illustrations of the architectural and landscape designs in his immediate environment.
2. Plants and animals in the environment often have alternative sources of food. All of the various interdependencies in a community are called a food web.	2. Wherever man lives he takes from the environment.	2. Man invents new terms and symbols for new discoveries.
3. A specific predator-prey relationship forms a food chain.	3. People in highly developed countries utilize most of the earth's materials.	3. Man may "reproduce" old cultural patterns by creating new dances based on ecological needs.
4. Changes in the environment, including pollution, may affect food chains.	4. The child produces little of the necessary materials and foods he needs. He is dependent on others. Later, when he may produce necessary things for society, he remains interdependent with the rest of society for his food, clothing, and shelter. He is also interdependent socially.	4. An understanding that objects are created in response to special environments may be developed by a study of pottery and decorations of different cultures.
5. Some agents of pollution may be concentrated in the upper levels of a food pyramid.		
6. Energy is the ability to do work.		

INTERACTIVE CONCEPTS FOR LEVEL 4

Pathway A Interdependence — In Interchange of Matter and Energy	Pathway B Interdependence — In Social Interaction	Pathway C Interdependence — In Cultural Components and Forms
Level 4. Life converts matter and energy into characteristic species form.	Level 4. Men interact to utilize the world's available resources.	Level 4. Cultures are characterized by their special ways of reacting to the environment.
1. Living things return matter to the environment.	1. With increased use of available resources, man has shifted from rural to urban living.	1. Musical instruments are products of the environment.
2. Living things are dependent on the environment they live in.	2. Man's relation to his environment has been altered due to urbanization.	2. Money forms are related to the environment.
3. All living things are dependent on sunlight as a source of energy.	3. Man has learned to utilize his natural resources.	3. The relationship between beauty and value may be illustrated by analyzing objects in the immediate environment.
4. Cells vary according to the functions they perform.	4. Man must conserve and protect his natural resources.	4. Unique uses of materials available in the environment lead to the development of special architectural forms.
5. Some nongreen plants get their energy from sources other than sunlight.	5. Men may live in similar environments but have different ways of living.	5. Dance and music forms reflect the important cultural aspects of the environment in which they were developed.
6. Life cycles of living things are adapted to specific environments and habitats.	6. Resources are available in different quantities throughout the world.	
7. Many different kinds of animal and plant communities exist.		

INTERACTIVE CONCEPTS FOR LEVEL 5

Pathway A Interdependence – In Interchange of Matter and Energy	Pathway B Interdependence – In Social Interaction	Pathway C Interdependence – In Cultural Components and Forms
Level 5. The environment is and has been in constant change.	Level 5. Social aims determine the utilization of resources.	Level 5. Men create objects, events, and behaviors that nurture their images of beauty and order.
1. Living things depend upon a carbon dioxide-oxygen cycle. The oxygen cycle can be interrupted by removal of green plants.	1. Man used exploration as a way of supplementing the available natural resources.	1. Man developed mythology and other literary forms to explain natural phenomena. Man can make up his own ecological mythology.
2. As the environment changes, the food webs change.	2. The values of a society affect the utilization of its natural resources.	2. Festivals were created by man to celebrate natural events (harvesting of crops, rainfall, winter solstice, and so forth).
3. The water cycle effects changes in the environment.	3. The availability of natural resources has influenced historical events.	3. Calendars were developed to satisfy man's need for order.
4. The environment is changed and/or maintained by the decomposition cycle.	4. An emphasis on a high rate of productivity leads to an accelerated depletion of natural resources.	4. Art, art forms, and decorations often reflect natural things in the environment.
5. Each environment goes through a succession of predictable changes.	5. Societies develop different ways of conserving, recycling, or destroying natural resources. The ways developed are dependent upon the social aims of the particular society.	5. Primitive dances reflected man's concept of nature and provided a positive outlet for negative feelings.
6. Forces of weather and mountain building are continually changing the earth's biomes.		

INTERACTIVE CONCEPTS FOR LEVEL 6

Pathway A Interdependence – In Interchange of Matter and Energy	Pathway B Interdependence – In Social Interaction	Pathway C Interdependence – In Cultural Components and Forms
Level 6. Man is the prime agent of change of the natural environment.	Level 6. Man modifies the environment in order to utilize his resources and to increase them.	Level 6. Men recreate their environment.
1. Technological advancement has increased man's ability to control the natural environment.	1. Man builds cities near natural resources. Urbanization has enabled man to concentrate human and natural resources for more efficient use.	1. City planning reflects man's need to create a pleasing environment (parks, malls, open spaces, and so forth).
2. Man, through his technology, has converted natural resources into other forms.	2. Man has pumped water into arid regions in order to utilize more land.	2. Man recreates natural environments in his home (aquariums, window boxes, and so forth).
3. Mining of natural resources has led to the destruction of some natural environments.	3. Man changes the natural terrain to build housing sites.	3. Music and poetry evoke feelings about man's natural environment.
4. Disposal of waste products is affecting the natural environment.	4. Man converts the grasslands into grazing lands.	4. Authors use "nature" similes and metaphors to illustrate meanings.
5. Through water and air pollution and over-use of land, man has changed the natural environment by upsetting the balance of nature.	5. Man builds dams and reservoirs to increase his water and energy supply. 6. Man sometimes destroys the environment in order to mine natural resources.	5. Man has learned to create a pleasing climate indoors.

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