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SCIENCE IN THE ELEMENTARY SCHOOLS, GRADE 6, A GUIDE FOR TEACHERS.

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TUPELO PUBLIC SCHOOLS, MISS.

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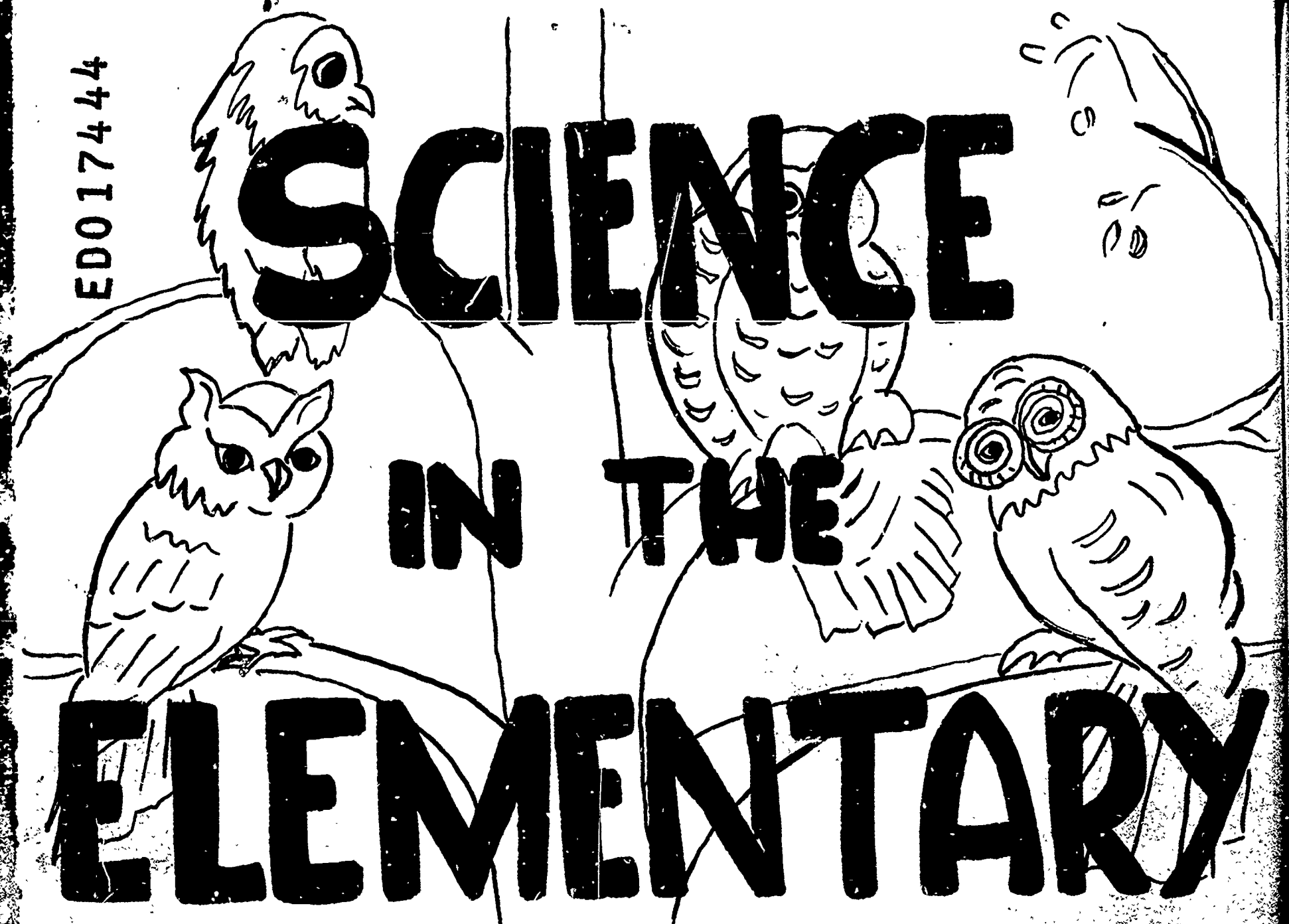
A COURSE OF STUDY FOR SCIENCE IN THE SIXTH GRADE IS DESCRIBED. DIVISIONS ARE (1) AN INTRODUCTION WHICH PROVIDES A RATIONALE FOR THE GUIDE AND LISTS THE MAJOR CONCEPTS, (2) A SECTION WHICH LISTS THE SPECIFIC SCIENCE CONCEPTS FOR EACH LESSON AND GIVES THE SCOPE AND SEQUENCE FOR GRADES THREE TO SIX, AND (3) A SECTION WHICH PRESENTS FOUR TEACHING UNITS. THE UNITS ARE (1) ANIMALS, (2) SPACE AND EARTH SCIENCE, (3) PLANTS, AND (4) MATTER, ENERGY, AND MACHINES. INTERSPERSED IN THE UNITS ARE SEVEN LESSONS ON THE INTERRELATIONSHIP OF PLANTS AND ANIMALS WITH THEIR ENVIRONMENT. SPECIFIC CONCEPTS, OBJECTIVES, STUDENT EXPERIENCES, INSTRUCTIONAL MATERIALS, AND AUDIOVISUAL AIDS ARE LISTED FOR EACH LESSON. SOURCES OF INSTRUCTIONAL MATERIALS AND AUDIOVISUAL AIDS ARE PROVIDED. THE GUIDEBOOK WAS DESIGNED FOR USE WITH EDUCATIONAL TELEVISION BUT IS NOT LIMITED TO THIS USAGE. THE GUIDE IS ONE OF FOUR, THE OTHERS COVERING GRADES THREE, FOUR, AND FIVE. (DS)



SCIENCE IN THE ELEMENTARY SCHOOL

GRADE 6

A GUIDE FOR TEACHERS

SCIENCE IN ELEMENTARY EDUCATION

GRADES 3-6

A GUIDE FOR TEACHERS

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FOREWARD

Science must be brought to the child at an early age because of the great scope of science and our dependence upon science as a way of life. The media through which this process will operate in conjunction with this Course of Study will be the television. As long as it remains accurate, sincere, and interesting, educational television will take its legitimate place as a tool for public education in science. Printed words and pictorial illustrations are the best means of carrying science to the public. With this Course of Study as a guide and educational television as a transmitter, it can develop the learner's enthusiasm in acquiring the necessary knowledge and skill to enable him to deal with his life and environment as our society requires in this world of today. The advantages of educational television instruction are obvious in science, as this subject lends itself well in explaining and showing the problems of science.

We wish to thank all of the elementary teachers, both from our faculty and the cooperating schools, who made outstanding contributions in the development of this course of study. Many have graciously given of their time and talents as this program was being prepared.

We are fortunate to have had the important supervision and outstanding assistance of Dr. Robert W. Plants and Dr. J. David

Mohler of the School of Education of the University of Mississippi.

This Course of Study should do much toward bringing direct simple answers to the many questions that arise as we work together in bringing to the children the experiences and the joys of discovery. We trust this will be helpful to you in your teacher-learning environment.

Mrs. James L. Taylor
Educational Television Science Teacher

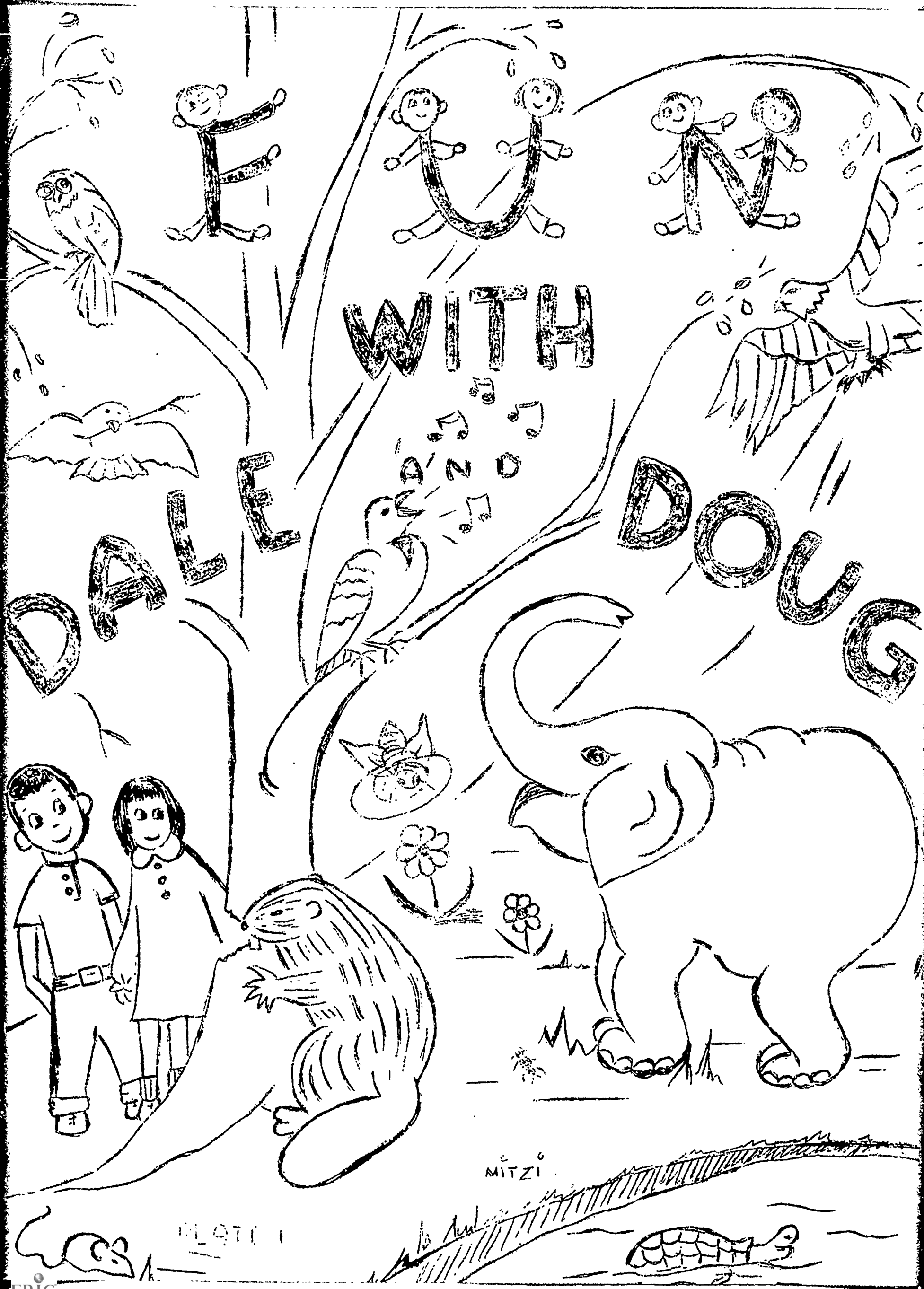
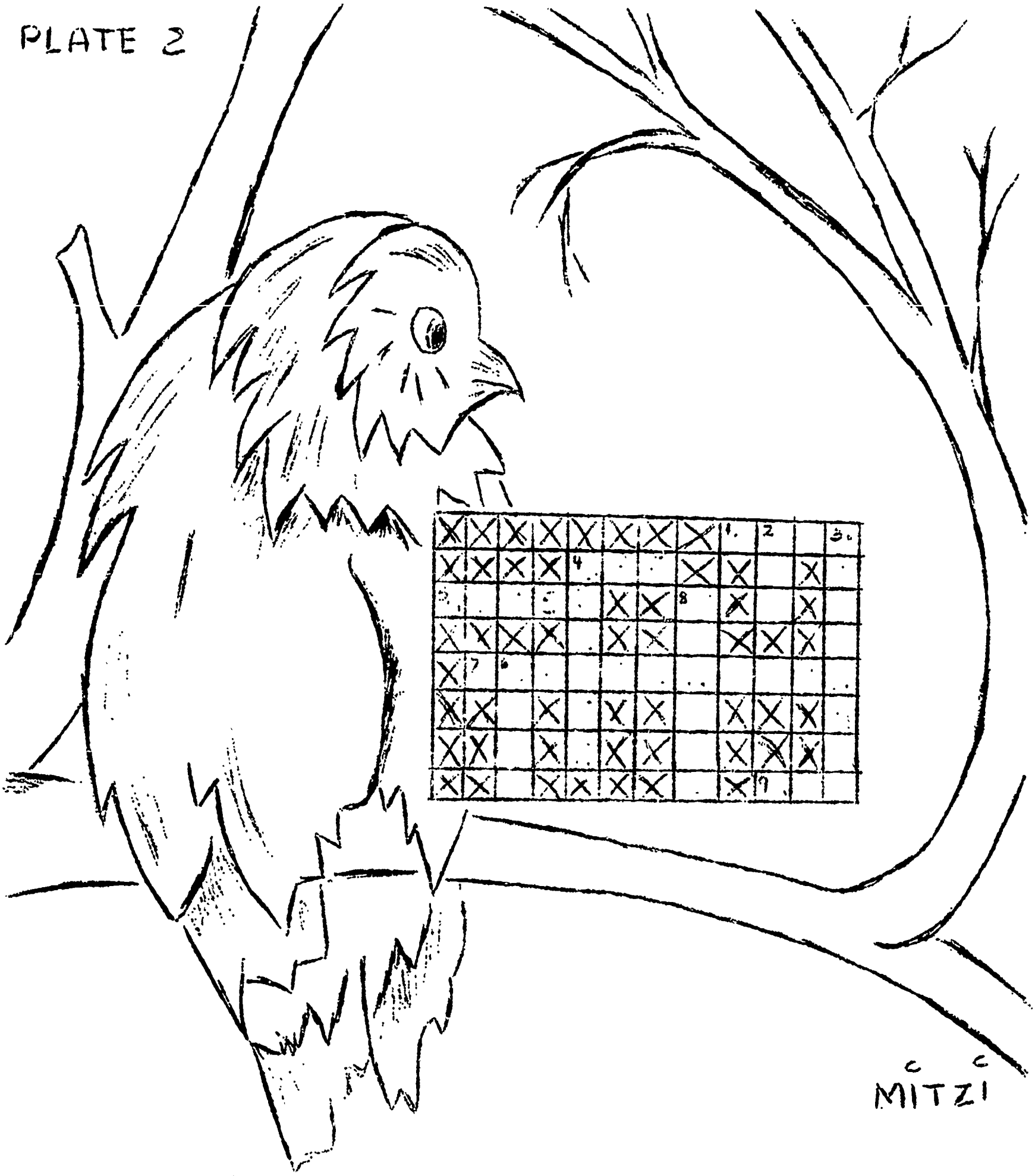

I
WITH
DALE AND
DOUG
MITZI

PLATE 2



MITZI

ACROSS

1. BIRD OF PEACE
4. BUSY AS A ____
5. QUIET AS A ____.
7. BRANCH THE DOVE CARRIES
9. INDUSTRIOUS AS AN ____.

DOWN

2. WISE AS AN ____.
3 LONG REMEMBERING AS THE-
4 AN EAGER ____.
6. HAPPY AS A ____.
8. DETERMINATION OF A ____.

I

INTRODUCTION

Science is being scrutinized because of its advance in technology. Modern attitudes in science are going through radical changes. There is a definite movement for children to learn and infer from their own observations. The educational system must convey traditional knowledge and culture as well as emphasize inquisitiveness and mental flexibility to the younger generation. This will help to free them for more challenging work that requires visions that will be adaptable to the new and future ideas. The present knowledge we have of science serves as a guide and not as a goal for the students' studies.

Science is of great interest to children. "The problem is not one of creating interest in science, rather, science programs must be built so that both the pre-existing interest and its natural curiosity about science, are fostered and cultivated in children."[1]

Children build their own concepts regardless of the teaching they receive. This Course of Study is to guide them in their observations, clarify their present concepts, and help them build basically sound concepts.

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[1]Harold E. Tannenbaum, Science Education for Elementary School Teachers, Boston: Allyn and Bacon, Inc., 1965, p. 55.

The children must develop in a logical sequence as they go through the grades. They must be aided in this gaining new concepts based on previously acquired knowledge along with their new learning experiences.

The living area is further divided into six lessons on animals and four in plants. The non-living are divided into space and earth science, with six lessons, matter, energy and machines with seven lessons. There are seven lessons on interrelationship of animals and plants with their environment.

Finally there is the area of motivation through teacher interest. Here is the factor which, though most important, is most likely to be a stumbling block. Many teachers grew up in schools where science, if it was taught at all, was a "sitting down, a reading, or a memorizing subject." The spark which, as children, they had for this area of learning was extinguished by sad school experiences. Teachers need to rekindle this spark in themselves. Only if they can develop a real interest in science can they nurture this interest in children.[2]

The student is not expected to grasp all of the factual material presented in the programs. The purpose of these programs

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[2]Ibid., p. 57-58

is to give an overview of the unity of all science and to develop an interest and curiosity on the part of the student in the things of science. It is relatively unimportant whether the student retains the majority of the details.

The purpose of this enrichment program is to introduce and broaden the basic aspects of science and the methods the scientists use. The biological and physical sciences are considered separately but are combined admirably in interrelated lessons. The living, biological science programs consider the animal for the fall study and the plant for the spring study. The fall is adaptable to studying animals while the spring time of year is especially adaptable to the study of plants. The earth sciences are studied during the winter to correlate noticeable weather changes, while matter, energy, and machines are adaptable any time of the year, so late spring was chosen.

It is not the intent of the course subject matter to duplicate the material found in the texts. It attempts to utilize the principles undertaken in the previous years and prepare a foundation for concept development in the forthcoming years.

All aspects of science are interrelated; a study of one field leads to an understanding of the others.

II

MAJOR CONCEPTS

A. Some things are living and some non-living.

1. Biology is the study of living things.
2. Zoology is the study of animals.
3. Botany is the study of plants.

B. To classify means to put in a group things that are alike in some way.

1. Living things are put together in one group because they have characteristics that set them apart from non-living things.
2. Living things are classified on the basis of structure in two large groups---plants and animals; these groups are divided into smaller groups; these in turn are divided into still smaller groups, and so on, down to individual species.
3. Some things on this earth are living and others are non-living.
4. Living things have special characteristics that separate them from the non-living.
5. Non-living things can be found to have some of the characteristics of the living.
6. Living things have a definite form and size.
7. Non-living things may be any size.
8. Living things have a definite length of life (except for disease and accident).
9. Living things are in a state of constant activity and depend upon a constant supply of vital energy to carry on their activities while non-living things are not in a state of constant activity and do not need a supply of energy.
10. All living things are either plants or animals.
11. Living things are able to move by themselves, take in oxygen or carbon dioxide from the air, use food, grow, reproduce like kind, and respond to stimuli.

C. All living things are made of cells.

1. Cells grow and divide.
2. Animals differ from plants in the structure of their cells.
3. Cells are grouped into tissues and tissues into organs.
4. Because of these organs, all living things are called organisms.
5. The common activities of plants and animals are called life processe .

6. Plants have cell walls that make the plants stiff.
7. Animals have cell walls that make the animal flexible.

D. Most animals move about in search of food, shelter, and protection from their enemies.

1. Plants remain rooted in one place and must be equipped to withstand changes in temperature and to obtain their food.
2. All living things need oxygen but they get it in different ways; while green plants use carbon dioxide as well as oxygen.
3. Living things must have food, water, and warmth to stay alive.
4. Animals either eat plants or other animals for food.
5. Those plants that are green make their own food.
6. Some plants get their food from decaying plants and animals.
7. Living things have adaptations that help them to get the things that they need.

E. Living things grow from the inside while non-living things grow from the outside.

F. Living things have certain characteristics.

1. Living things grow by taking in food and making it a part of themselves.
2. Living things resemble their parents.
3. Plants and animals respond to outside influences in different ways.

G. Many things are non-living.

1. Rocks and minerals are non-living.
2. Wind moves but is not alive.
3. Machines move but are not alive.
4. Light and sound are forms of energy.

III

EXPERIENCES

A. Have the children tell the important differences in some living and non-living things they named.

B. Compare common animals and plants with other objects giving the differences between them.

C. Discuss the things that are necessary to stay alive.

D. Note when a living thing is no longer living as a tree being made into a table.

E. Illustrate that growth is a kind of movement by placing a plant so that its leaves are away from the light. After a few days note the direction of the leaves.

F. Note that the wind moves but that it lacks some of the other characteristics of the living.

G. Illustrate how the things that are needed are obtained by different adaptations.

H. Have the children breathe deeply then exercise and compare the number of times they breathe.

I. Observe the breathing of a fish in an aquarium.

J. Examine the stems of plants, such as cattails, to see the hollow stems through which air passes to the roots.

K. Ask the children to bring pictures of different animals. Discuss their food, their adaptations to get the food they need and the parts of their bodies that help them.

L. Illustrate how a green plant makes food by placing a plant in a dark place for a few days then placing it in the sunlight.

M. Show how green plants store excess food in roots (carrots, stems, potatoes) and leaves (lettuce).

N. Ask the students to trace the origin of one of the foods they had for breakfast.

O. Observe the cell of an animal and plant under the microscope.

P. Note the rolling snowball and the crystal growing. They lack some of the other characteristics of the living.

Q. Illustrate the manner in which some cells bring water to the leaves of the plant by placing a stalk of celery in water which has food coloring or ink added.

R. Show that all life depends upon the sun. Illustrate that a plant will die if it does not have sunlight and that all animals indirectly depend upon plants for food.

S. Let the children study the growth of a plant or reproduction by propagating plants by seeds, runners, cuttings, or leaves.

T. Study the resemblances of offsprings to parents by showing pictures.

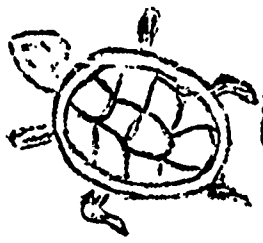
U. Obtain frog's eggs, place in an aquarium, and watch the development until the tadpole emerges.

V. Examine a rock collection to decide if it is living or non-living.

W. Study simple machines to learn their characteristics.

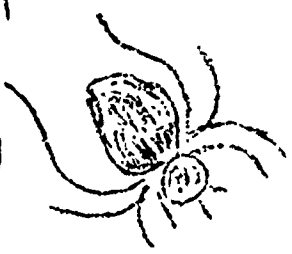
X. Run experiments with light and sound to prove that they are not alive.

ANIMAL KINGDOM



CHORDATA

TURTLE



SPIDER

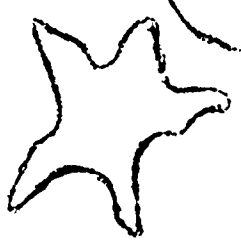
ARTHROPODA

MOLLUSCA

SNAIL

ANNELIDA

EARTHWORM



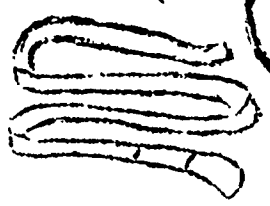
ECHINODERMATA

STARFISH

HOOKWORM

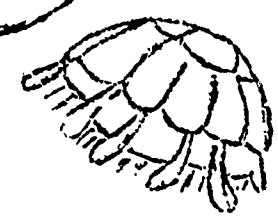
NEMATHELMINTHES

PLAYTHELMINTHES



TAPEWORM

COELENTERATA



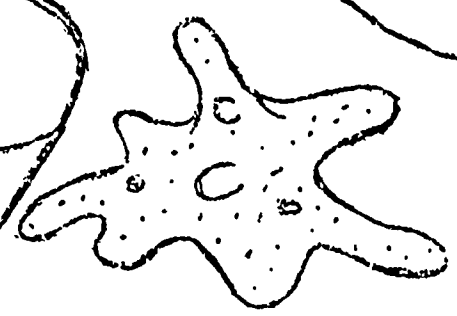
JELLY FISH

PORIFERA

BATH SPONGE

PROTOZOA

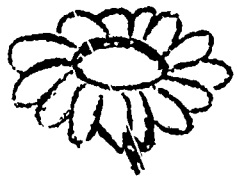
MITZI



AMEBA

PLATE 3

PLANT KINGDOM



DAISY

ANGIOSPERMS

SPERMATOPHYTES

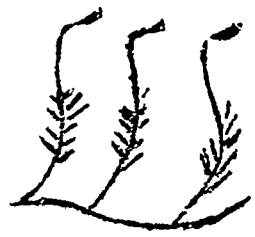
GYMNOSPERMS

CONIFER

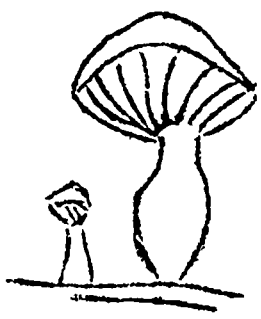
FERNS

PTERIDOPHYTES

BRYOPHYTES



MOSSES



FUNGI

THALLOPHYTES

MUSHROOM

ALGAE

RED ALGAE

PLATE 4

SCOPE AND SEQUENCE

WEEK	GRADE 3	GRADE 4	GRADE 5	GRADE 6
1	Introduction	Introduction	Introduction	Introduction
	UNIT I ANIMALS			
	GROUP	GROUP	GROUP	GROUP
2	10-man	9-insect	10-man	10-man
3	9-insect	10-man	9-insect	9-insect
4	9-Arachnida	9-Crustacea	9-Myriapoda	9-Insecta
5	1 and 2 one cell - two layer	3 and 6 prickly - spiny	4 and 5 flatworm - roundworm	7 and 8 sectionworm - Mollusk
6	10-birds	10-reptiles	10-amphibians	10-fish
7	10-mammals	10-mammals	10-mammals	10-mammals
8	10-pets	10-pets	interrelated	interrelated
9	interrelated	interrelated		

UNIT
II
SPACE - EARTH

10	space-solar system	space-constellations	space-milky way	space-zodiac
11	space-moon	space-time	space-time	space-time
12	earth-weather	earth-watercycle	earth-precipitation	earth-winds
13	interrelated-safety	interrelated-safety	interrelated-safety	interrelated-safety
14	earth-dinosaurs	earth-changing	earth-rocks, minerals	earth-rocks
15	earth-lithosphere	earth-volcanoes	earth-earthquakes	earth-mountains
16	earth-ocean floor	earth-oceans	earth-ocean floor	earth-glaciers
17	interrelated-seashore	interrelated-desert	interrelated-ponds	interrelated-forests

PLATE 6

UNIT
III*
PLANTS

18	1-simplest, non-green	1-simplest, non-green	1-non-green	1-non-green
19	1-simplest, green	2 - 2nd simplest, green	3-reproduction spores	4-flowering
20	4-function, seed	4-function, stem	4-evergreen	4-function, flower
21	4-function, root	4-special adaptation	4-function, leaf	interrelated-partners
22	interrelated-adaptation	interrelated-adaptation	interrelated-partners	interrelated-emergencies

*For the sake of simplicity the naming of the groups are not consistent as to phylum, class, or order.

PLATE 7

PLATE 8

UNIT
IV
MATTER, ENERGY, MACHINES

23	matter-atom	matter-elements	matter-molecules	matter-water
24	poison	poison	no lesson	no lesson
25	science fair	science fair	matter-molecules	matter-changes
26	energy-magnets	energy-electricity	energy-electricity	energy
27	energy-electricity	energy-electricity	energy-electricity	energy-electricity
28	energy-light	energy-light	energy-light	energy-light
29	energy-sound	energy-sound	energy-sound	energy-sound
30	machines	machines	machines	machines
31	Mississippi	Mississippi	Mississippi	Mississippi
32	Evaluation	Evaluation	Evaluation	Evaluation

PART FOUR

GRADE SIX

PLATE 9

MITZI

CONCEPTS IN SCIENCE

PART FOUR

GRADE SIX

Introduction

General Concepts

Experiences

Lesson One
(Interrelated)

Concept: Some things are living and other things are non-living.

UNIT ONE

LIVING THINGS

ANIMALS

Introduction

Major Concepts

Experiences

Lesson Two

Concept: Proper foods are necessary for good health, growth, and development.

Lesson Three

Concept: There are many kinds of insects, more than all other kinds of animals together.

Lesson Four

Concept: Some animals have a permanent association from year to year.

Lesson Five

Concept: The group of animals called mollusks vary tremendously in size and appearance.

One group of animals is the sectionworm.

Lesson Six

Concept: The life history of fish varies.

Lesson Seven

Concept: Mammals have more highly developed bodies than other animals.

Lesson Eight
(Interrelated)

Concept: To keep an underwarter animal alive, we control the water in which it lives.

UNIT TWO

NON-LIVING THINGS

SPACE-EARTH

Introduction

Major Concepts

Experiences

Lesson Nine

Concept: The constellations are groups of stars that seem to be arranged in patterns.

Lesson Ten

Concept: Many years of human effort have gone into the science of telling time.

Lesson Eleven

Concept: Great air masses are caused by the movement of heavenly bodies in relationship to each other.

Lesson Twelve
(Interrelated)

Concept: An ounce of prevention is worth a pound of cure.

Lesson Thirteen

Concept: There are many kinds of rocks with different characteristics.

Lesson Fourteen

Concept: Mountains are the highest areas on the earth.

Lesson Fifteen

Concept: There are many interesting things within the boundaries of the Polar Region.

Lesson Sixteen
(Interrelated)

Concept: Life in the forest can be beautiful.

UNIT THREE

LIVING THINGS

PLANTS

Introduction

Major Concepts

Experiences

Lesson Seventeen

Concept: Bacteria possess a cell membrane plus a thickened cell wall that enables us to classify them as plants.

Lesson Eighteen

Concept: Trees are important to us in many ways.

Lesson Nineteen

Concept: Flowers function in the production of seeds and fruits.

Lesson Twenty
(Interrelated)

Concept: Whether mammal, bird, insect or fish, their strange partners and their comings and goings are often unique and sometimes unbelievable.

Lesson Twenty-One

Concept: In every emergency there are correct actions to take.

UNIT FOUR

NON-LIVING THINGS

MATTER-ENERGY-MACHINES

Introduction

Major Concepts

Experiences

Lesson Twenty-Two

Concept: Water has unique chemical and physical properties that are related to its molecular structure.

Lesson Twenty-Three

Concept: Changes take place in matter and energy.

Lesson Twenty-Four

Concept: Without doubt, nuclear energy will become increasingly important as an energy source in the future.

Lesson Twenty-Five

Concept: The electricity we use in our homes comes through a huge network of circuits originating with the central generating stations. It is trensmitted through high voltage transmission lines to substations and then through distribution systems to our homes. Our household wiring is a part of this network and delivers the electricity to our individual lights and appliances.

Introduction: Many students and adults have little understanding of their own electrical systems (wiring) and the relationship betweer these systems and the larger generation and distribution network.

Lesson Twenty-Six

Concept: Visible and invisible light are forms of radiant energy.

The eye is an organ which receives light, forms images and sends the images to the brain to interpret them.

Lesson Twenty-Seven

Concept: Sound is one form of energy.

Lesson Twenty-Eight

Concept: Machines are able to change energy from one form to another.

Lesson Twenty-Nine
(Interrelated)

Concept: A plant is a part of a community.

Animals are found in different plant communities.

Man has an effect on the natural balance of plant and animal life.

Lesson Thirty
(Interrelated)

Concept: Evaluation is necessary to learn of the progress made during the year.

LESSON ONE
(Interrelated)

The child learns at an early age that some things are able to move while other things remain where they are placed until some outside force moves them. Experiences of children with living things are brought about by contact with people and with other living things. The plants and animals which children become familiar with depend upon the part of the world in which they live.

Many children by the time they are in the sixth grade will be aware of the chief differences between these living and non-living objects. For these students, critical examination of objects will be necessary.

I. CONCEPT:

Everything is iether living or non-living.

II. OBJECTIVES:

A. To realize non-living things can be found to have some of the characteristics of the living

B. To dentify two kinds of living things

C. To know that living things have certain requirements to stay alive

D. To help the students to understand that plants and animals are living things and there are many ways in which they are alike

E. To recognize the many ways in which plants and animals differ

III. PROBLEM:

To determine some of the differences between living and non-living things.

IV. MORE FUN:

A. Books:
1. Parade of the Animal Kingdom, Robert Hegner
2. Zoology, Introduction to the Animal Kingdom, Herbert S. Zinn
3. Insects and Plants, Irvin Adler
4. Natural History Adventures, Marion B. Carr
5. Giant Golden Book of Biology, Rose Wyler and Gerald Ames
6. Odd Pets, Dorothy G. Hogner

B. Films:
1. Living and Non-living Things, Cor
2. What's Alive? FA
3. Living Things Are Everywhere, EBF

C. Filmstrips:
1. Living Things, Jam Handy
2. Animals, Plants and Their Environment, McGraw-Hill
3. Living Things, SVE
4. How Animals Are Grouped, McGraw-Hill

UNIT ONE

ANIMALS

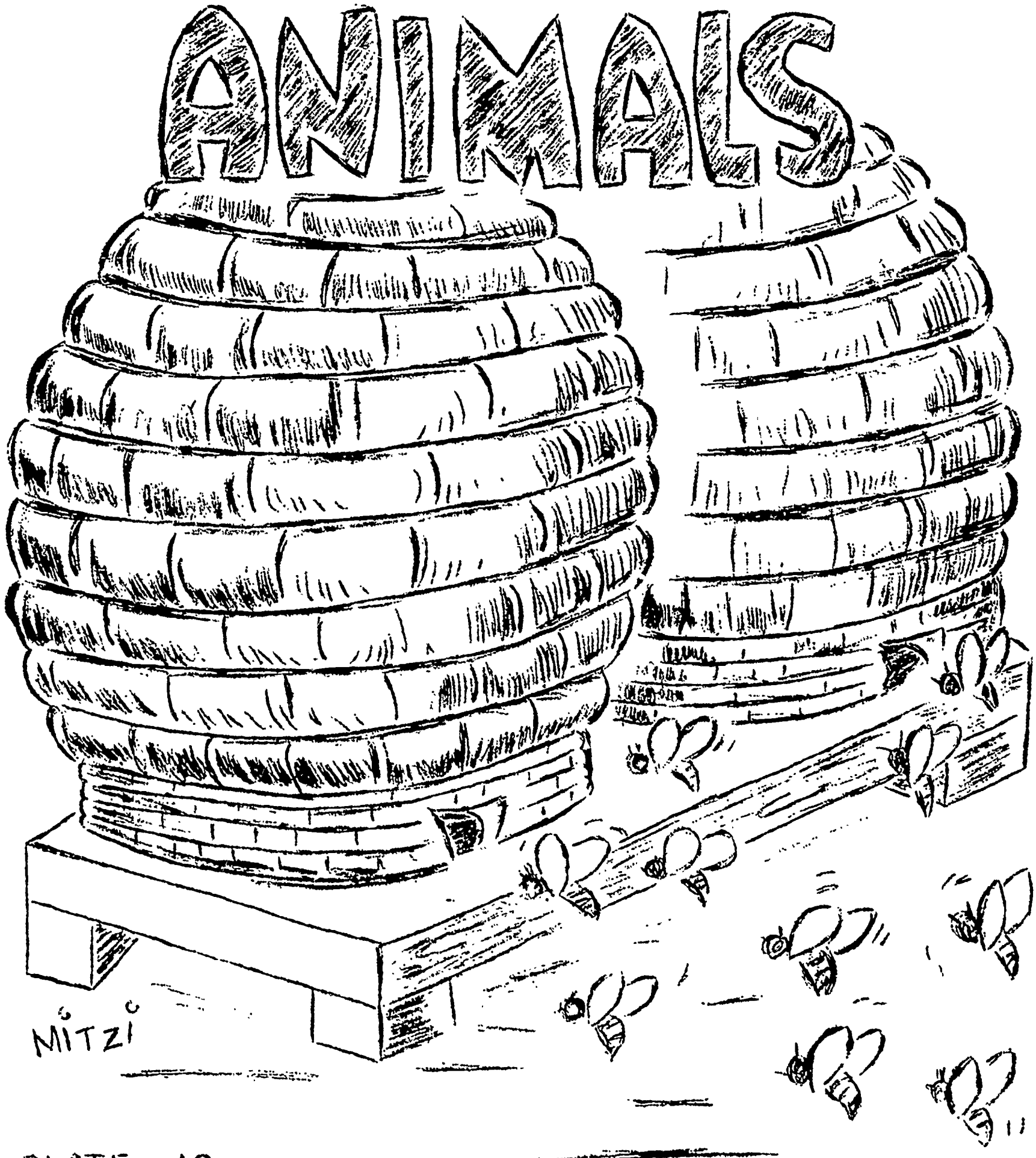


PLATE 10

UNIT ONE

LIVING THINGS

ANIMALS

I

Introduction

It is impossible to study animals along because they are related to their environments closely. The material to be learned is divided into large groups to aid in easier learning. This first division is of the living and the non-living things. A further division of the living is the animals and the plants. Each of these divisions is further divided for simplicity in learning.

It is important that the children develop an awareness of the vast number of plants and animals. The first unit of study is concerned primarily with the study of animals. The first animals studied in the lower grades were the simpler ones progressing to the more difficult animals. Some representative member from each division is included in this study. This covers each of the ten phyla of the animal kingdom, giving special consideration to each of the five classes of chordates. A wide general background of animals is presented.

In this unit man is studied among the first. This is needed to show the necessity that man should care for his being to the best of his knowledge.

The study progresses to insects because of their great number and our need for knowledge concerning them. Further study of insects from the social insect division is important from an interest and economic standpoint.

Divisions of animals that are not as common as the insects willcomplete our study of representative groups of animals.from all the phyla. The trend has been to include as many of the water examples as possible without detracting from the overall program.

The interrelationship of plants, animals and their environment is considered in the last lesson in the unit.

While classification is not a major purpose of the unit, children may be encouraged to observe certain characteristics that are typical of any one class. An opportunity is given to the students to aquaint themselves with the animal divisions and encounter many interesting experiences that will add to their knowledge of the study of animals.

II

Major Concepts

A. We have basic food needs

1. Foods provide the body with the necessary things for proper growth and repair

2. There are three basic types of foods, fats, proteins, and carbohydrates

3. Energy is provided by the fats and carbohydrates

4. Some energy is provided by proteins but the chief function of the protein is to provide material for the production of cells and the repair of tissues

5. If the body is to function properly it needs vitamins and minerals

6. A balanced diet provides the body with appropriate amounts of all the needed nutrients

B. There are many kinds of insects

1. Some insects go through a complete metamorphosis from egg to adult

2. Some insects go through a partial metamorphosis from egg to adult

3. Insects have three body parts, head, thorad and an abdomen

4. Many insects have two large eyes that are made up of many small eyelets, and three small eyes

5. A few insects are helpful to man

6. There are many insects that are harmful to man and animals

7. Scientists are learning how to controle many harmful insects

C. Some animals have developed life patterns which cause them to stay together for their own protection and mutual assistance in obtaining food

1. Animals that live together usually help to protect their young

2. Some animals live together in order that they may help each other in their daily activities, such as the beaver or prairie dog

3. Some insects, such as the bees and ants, live together so that they help each other provide for the whole group

4. Different bees have different tasks within a bee hive

5. Some animals have developed teeth to aid in getting food, making homes and providing for their needs

6. The feet of many animals areespecially adapted so that the animal can live in a special kind of place

7. Some animals live together for short lengths of time to aid them in hunting prey, such as the wolves

D. One classification of animals without internal supporting structures is the invertebrates

1. Some invertebrates are of medium complexity, multi-cellular and softbodied

2. The most complex invertebrates have some type of external body support

3. Every animal has certain behavior patterns

4. The invertebrates are the food for many other animals

5. The segmented worms are the most complex group of worms

6. Earthworms are among the segmented worms

7. Earthworms are useful to man

E. The simplest vertebrates are fish

1. Fish get oxygen through gills

2. Fish are cold-blooded animals

3. Fish are an important source of protein food for man.

4. Man will someday grow and harvest fish like a crop that grows on land

F. Mammals are found in almost all parts of the world

1. Mammals have certain characteristics

2. Mammals are classified according to their structure

3. Most mammals have bodies covered with hair

4. Almost all mammals are born alive and are fed milk produced by the mother.

5. Most mammals have well developed teeth

6. Mammals are warm-blooded

7. Mammals have the largest brain as compared to the size of body of any of the animals

G. The brine shrimp is suitable for experiments

1. The brine shrimp is not closely related to the shrimp that we eat

2. The brine shrimp is important as a food for fish

3. Brine shrimp live well in many places

III

Experiences

A. Lesson Two

1. Ask the pupil to keep a record of the food they eat over a three day period. Figure the average daily caloric intake and the necessary vitamins.

2. Learn to test foods for starch, fat, sugar, and protein.

3. Have the students make a comparison of cost per pound among foods high in fats, carbohydrates and proteins.

4. From labels, find as many different vegetable fats as you can.

5. Secure pamphlets from the Health Department.

B. Lesson Three

1. Observe the stages of growth of the meal worm.

2. Obtain a demonstration beehive from a local beekeeper and study the habits of the bees.

3. Grasshoppers may be examined with a magnifying glass.

4. Cockroaches may be raised in a fruit jar for a while, and the children can observe the growth.

5. Prepare an interesting ant nest.

6. Select cocoons and store them over the winter. Watch for them to hatch out in the spring.

C. Lesson Four

1. Visit an apiary. Study the life of the bee.

2. Ask a beekeeper to talk to the class.

3. Visit a beaver dam.

4. Collect abandoned wasp next.

D. Lesson Five

1. Study the snails you have in your aquarium.

2. Obtain a living clam and observe the way it obtains food materials and oxygen from the water.

3. Display the many sea shells the class members bring to class.

4. Prepare a bulletin board of animals that belong to this group, mollusk, that do not have hard shells.

5. Sparate the shells into the groups that have one shell and the ones that have two parts to their cover.

6. Visit a worm farm.

7. Observe an earthworm in the classroom.

E. Lesson Six

1. Observe the fish in your aquarium.

2. Prepare a display of all the animals that are fish.

3. Tell of your experiences when visiting an oceanarium

4. Visit a fish hatchery.

F. Lesson Seven

1. Visit a zoo to observe the mammals.

2. Visit the farm to see the animals.

3. Bring in models of the mammals and arrange in groups with like characteristics.

G. Lession Eight

1. Raise your own brine shrimp.

2. Raise pond animals in your aquarium.

3. Observe any of the living animals in your school room. Notice the things that are necessary for their survival.

LESSON TWO

I. CONCEPT:

Proper foods are necessary for good health, growth, and development.

II. OBJECTIVE:

A. To learn what foods are necessary for certain development of the body.

B. To learn why certain foods are necessary for development of the body.

C. To learn when certain foods are needed for proper development of the body.

D. To learn how foods are used in the proper development of the body.

E. To learn the importance of eating the proper foods in the correct amounts at the correct time.

F. To develop an awareness of the great need for proper nourishment.

III. PROBLEM:

To cause sufficient understanding to enable the students to partake of the proper foods at all times.

IV. MORE FUN

A. Books
1. Milk, Mae McCrory
2. The First Book of Food, Ida Scheib
3. Milk for You, G. Warren Schloat
4. Your Food and You, Herbert S. Zim
5. The Wonders Inside You, Margaret S. Cosgrove
6. Wonders of the Human Body, Anthony Raveilli
7. Whats Inside of Me?, Herbert S. Zim

8. The cook-A-Meal Cookbook, Garel Clark
9. Skinny Joins the Circus, Lee Bloomgarden
10. All About the Human Body, Bernard Glesmer
11. How Your Body Works, Herman and Nina Schneider

B. Films
1. Bread, EBF
2. Food Store, EBF
3. Food That Builds Good Health, CIF
4. Fundamentals of Diet, EBF
5. Good Eating Habits, CIF
6. About the Human Body, CWFP
7. You and Your Food, WDP
8. You and the Living Machine, WDP
9. Wonders of Our Body, MIS
10. Alexander Learns Good Health, CIF
11. Eat for Health, EBF

C. Filmstrips
1. Food for Health, YAF
2. You and Your Food, YAF
3. Food and Nutrition, EBF
4. Your Food and Digestion, Jam Handy
5. How Vitamins Help Man, PS
6. Your Heart and Lungs, JH
7. Your Bones and Muscles, JH
8. You, The Living Machine, EBF
9. You, The Human Being, EBF
10. Avoid Infection, EBF

LESSON THREE

I. CONCEPT:

There are many kinds of insects, more than all other kinds of animals together.

II. OBJECTIVES:

A. To review the three body parts of an insect.

B. To study the eye arrangement of the insect.

C. To review the developmental stages of an insect.

D. To learn of the few insects that are helpful to men.

E. To learn of the many insects that are harmful to man and animals.

F. To learn the control of the many harmful insects.

G. To develop an awareness and interest in the many insects in the out-of-doors.

III. PROBLEM:

To review the life of the insect and add interesting information to give the student a well balanced knowledge of insects.

IV. MORE FUN

A. Books

1. Insect Engineers, the Story of Ants, Ruth Bartlett
2. Crickets, Oliver L. Earle
3. Collecting Cocoons, Lois J. Hussey
4. Insects-Hunters and Trappers, Ross E. Hutchins
5. Insects on Parade, Clarence J. Hylander
6. All About the Insect World, Ferdinand Lane
7. All About Moths and Butterflies, Robert S. Lemmon
8. Monarch Butterfly, Marion W. Marcher
9. American Butterflies and Moths, Cecil H. Matschar
10. Green Darner: The Story of a Dragonfly, Robert McClung

B. Films

1. Beetles, EBF
2. Butterflies, EBF
3. Dragons and Damsels, AF
4. Grasshopper: A Typical Insect, CIF
5. How Insects Help Us, CIF
6. Life Cycle of the MQsquito, YAF
7. Mosquito, EBF
8. Moths, EBF
9. Pond Insects, EBF
10. Silk, EBF

C. Filmstrips

1. American Insect Guide, YLF
2. Backyard Insects, AVE
3. Controlling Insect Pests, Photo Lab.
4. Insect Pest and Disease, YAF
5. Man Against Insects, PS

LESSON FOUR

I. CONCEPT:

Some animals have a permanent association from year to year.

II. OBJECTIVES:

A. To learn about the habits of social insects

B. To learn of the specialization of the members of the group

C. To notice the differentiation of duties by the members of the group

D. To learn the detailed information about the structural characteristics of the members of the group

E. To study the special adaptations of the members of the groups

F. To develop an awareness of the economic importance of some groups of insects

G. To create an interest in social insects

III. MORE FUN

A. Books

1. Honeybee, Mary Adrian
2. All About the Insect World, Ferdinand Lane
3. The Makers of Honey, Mary Geisler Phillips
4. Time for Sleep; How Animals Rest, Millicent Selsam
5. A First Book of Bees, A.B. Tibbets
6. Honeybee, Mary Venn
7. Close-up of a Honeybee, Virgil E. Foster
8. A Beaver Story, Emil Liers

B. Films

1. Ant City, ALF
2. Ants, EBF
3. Beaver Valley, WDP
4. Honeybee, EBF
5. Honeybee: A Social Insect, CIF
6. Natures Engineers, The Beavers, WLF
7. Nature's Half Acre, WDP
8. Story of Bees, UWF

C. Filmstrip

1. Life of The Honeybee, SVE
2. The Ant, Eye Gate
3. Bee Society, VEC
4. Honeybee, Eye Gate
5. Insect Communities, CF

LESSON FIVE

I. CONCEPT:

A. The group of animals called mollusks vary tremendously in size and appearance.

B. One group of animals is the sectionworm.

II. OBJECTIVE

A. To learn of the more complex invertebrates that usually have some type of external support.

B. To learn of the characteristic behavior patterns of the group of animals belonging to the multicellular soft bodied animals.

C. To cause an understanding of the likenesses and differences of animals in certain groups.

D. To cause an understanding of groups of animals with like characteristics grouped together in smaller and smaller groups for simplicity of learning.

E. To create an interest in collecting mollusk shells as a hobby.

F. To learn the economic importance of the mollusk group of animals.

G. To study the group of worms called the segmented worm.

H. To learn the economic importance of the segmented worms.

III. PROBLEM

To give the student a workable knowledge of the more complex soft-bodied animals.

IV. More Fun

A. Books
1. The Octopus, Olive Lydia Earle
2. The sea Around Us, Rachel Louise Carson
3. Illustrated Book of the Sea, Leon Hausman
4. A Childs Book of Shells, William Hutchinson
5. Wee Folk At the Seashore, Carroll Lane Fenton
6. Let's Go to the Seashore, H.E. Huntington
7. The Wonderworld of the Seashore, Marie Neurath

B. Films
1. Beach and Sea Animals, EBF
2. Coco Explores A Pier, Rampart Productions
3. Life in the Sea, EbF
4. Salt Water Wonderland, Sterling
5. Sea Zoo, Almanac
6. The Seashore, Arthur Barr

C. Filmstrips
1. Shellfish of the Seashore, JH
2. American Seashores, YA
3. Freshwater Shellfish and Amphibians, JH
4. Low Tide on the Beach, CF
5. Plants and Strange Animals of the Sea, JH
6. Shellfish of the Seashore, JH

LESSON SIX

I. CONCEPT

The life history of fish varies.

II. OBJECTIVES

A. To learn about the internal support of the simplest vertebrates.

B. To learn the characteristics of the fish.

C. To cause an understanding of the many kinds of fish.

D. To cause an understanding of why different fish are grouped together.

E. To create an interest in fish.

F. To become aware of the great economic importance of fish.

III. PROBLEM

To obtain a basic understanding of the class pisces, fish.

IV. MORE FUN

A. Books
1. Fishes, Bertha M. Parker
2. Field Book of Ponds and Streams, Ann Morgan
3. Pets from the Pond, Margaret W. Buck
4. Creatures of the Deep, Anges McCarthy
5. Marvels of the Sea and Shore, Oren Arnold

B. Films
   1. A Fish Family, Moody
   2. Fish Are Interesting, FAC
   3. Field Trip to a Fish Hatcherie, Coronet

C. Filmstrips
   1. American Fishes, YLF
   2. Freshwater Turtle and Fish, JH

LESSON SEVEN

I. CONCEPT

Mammals have more highly developed bodies than other animals.

II. OBJECTIVES

A. To learn the characteristics of the mammals

B. To learn of special adaptations of some of the mammals.

C. To learn of mammals in various habitats.

D. To study the economic importance of the mammals.

E. To create an interest in the mammals of the world.

III. PROBLEM

To present the subject of mammals in such a manner that the student will learn many characteristics of this group of animals.

IV. MORE FUN

A. Books

1. Animals That Help Us, Carrol Lane Fenton
2. A Time for Sleep, Millicent E. Selsam
3. Wild Folk In the Woods, Carrol Lane Fenton
4. Here Comes The Deer, Alice E. Goudey
5. Animal Masquerade, Ivah Green
6. Field Guide To Animal Tracks, Olaus J. Murie
7. Lone Muskrat, Glen Rounds
8. Animals From Everywhere, Clifford Webb
9. Zoo Expositions, William Bridges

B. Films
   1. Animals In Spring, EBF
   2. Animals in Summer, EBF
   3. Animals in Winter, EBF
   4. The Bear and Its Relatives, Coronet
   5. The Beaver, EBF
   6. Natures Engineer, WLF
   7. Animals and the Rocky Mountains, Coronet

C. Filmstrips
   1. Monkeys and Their Relatives, SVE
   2. Large, Hoofed Mammals, SVE
   3. Bears, Pandas, Raccons, SVE
   4. Rodents, SVE
   5. Cats and Dogs, SVE
   6. Hibernation, Curr.F.

LESSON EIGHT
(Interrelated)

I. CONCEPT

To keep an underwater animal alive, we control the water in which it lives.

II. OBJECTIVES

A. To illustrate that any plant or animal has to adapt to its environment if it is to survive.

B. To discover how to keep underwater animals alive.

C. To learn the natural enemies of the brine shrimp.

D. To discover what temperature is best for hatching brine shrimp.

E. To discover the effect of aeration on the number of brine shrimp eggs that will hatch and grow.

F. To discover the effect of tank shape and water depth upon the hatching of brine shrimp.

G. To discover the effect of acidity upon the hatching and growth of brine shrimp.

H. To discover the effect of feeding upon the growth of brine shrimp which have hatched.

I. To discover the effect of sudden changes of conditions upon brine shrimp.

J. To create an interest in brine shrimp.

K. To learn of the economic importance of brine shrimp.

III. PROBLEM

To teach scientific methods of experimenting by using the brine shrimp as an example.

IV. MORE FUN

Books

. Underwater Life, Dr. Carleton Ray
B. Marine Fishes of Southern California, P.S. Barnhart
C. Fieldbook of Fishes of the Atlantic Coast, C.M.Breder
D. Animals Without Backbones, R. Buchsbaum
E. The Sea A ound Us, R. Carson
F. How To Know The Freshwater Fishes, S. Eddy
G. Dangerous Marine Animals, B.W. Halstead
H. Field Book of Seashore Life, R.W. Miner
I. Between Pacific Tides, J. Calvin and B.F. Ricketts
J. Seashores, L. Ingle and H.S. Zim

UNIT TWO

SPACE AND EARTH

PLATE II

UNIT TWO

NON-LIVING THINGS

SPACE-EARTH

I

Introduction

In this unit you will study about the Universe. Elementary school students consider the study of the Universe to be one of the most interesting areas of science. The activities of space have been an additional incentive for students to study this area of science. It is one of the most difficult to teach because few experimental activities can be used and many of the concepts are of necessity abstract.

From the earth, the stars seem to be arranged in patterns. To some people, these patterns have resembled familiar things. Most of the constellations were named in very early times by people who spent a great deal of time watching the stars.

One of the first things a youngster learns once he starts to school is how to "tell time". The clock and the calendar are taken so much for granted, in fact, that few of us stop to wonder how man ever learned to tell time in the first place. It took mankind thousands of years to puzzle out a system which in some ways isn't perfect yet. This lesson is concerned with the clock we live on, a clock that never needs winding.

An interesting lesson is the one that introduces the students to the relationship between the atmosphere, hydrosphere, lithosphee and solar radiation in the formation of weather. It deals with the formation of air masses, their characteristics and the changes taking place at their fronts. The field of jet stream meteorology is relatively new. This study should help students to understand the relationship between the jet stream activity, air mass movement, and local weather phenomena.

The lesson for safety is designed to better prepare the student to be safety conscious at all times and to be especially careful with any new gift he might receive. To review the old laws and become acquainted with the new is always an aid.

A hobby that can provide a lifetime of pleasure, adventure and education is rock collecting. This can be a year-round activity. It's healthful, and it need not be expensive. Rocks do not fade, wilt or die and need no upkeep. This area of study deals with nothing less than the earth we live on.

Children are given an opportunity to investigate the forces which are constantly changing the Earth's surface. Understanding orderly and predictable change is an important objective of any science unit and in particular of this one. Children become aware that there are twin forces at work which are constantly changing the earth. Some changes in the Earth's crust are based on actual observations.

The lesson on the Polar Region is a useful introduction to what we already know and sets the stage for better understanding of all the future Polar achievements we can expect.

Today we realize that we must conserve the Earth's resources. We will explore some conservation practices, while we enjoy learning of the many plants and animals we find living in harmony in the forest environment.

II

Major Concepts

A. Patterns in the sky are called constellations

1. The stars seem to move across the sky from East to West: this apparent motion is due to the Earth's rotation

2. Different constellations are seen at different times of the year

3. Most of the best known constellations appear along the ecliptic

4. The ecliptic is the apparent path of the sun through the sky during the year.

5. The constellations are helpful guides in the sky.

B. The movement of the celestial bodies is the basis for the calendar

1. Man probably measured time by observing the movements of shadows caused by the earth's rotation

2. Units of time are based on the earth's rotation and revolution

3. The seasons are due to the movement of the earth around the sun and the tilt of the Earth's axis

4. The sun shines directly on the place you live twice a year

C. There is a relationship among jet stream activity, air mass movement, and local weather phenomena

1. There is a difference in the temperature, pressure, humidity, size, and direction of movement in air masses

2. The cold air masses over the polar regions are dense, have high pressure, and are usually dry. They remain close to the earth as they move

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3. The warm air masses over the tropical regions have a low density and low pressure and are usually moist

4. Weather changes take place at the front or on the sides of the air mass

5. The weather changes at the cold fronts are more violent than those at warm fronts

D. Caution and courtesy are vital factors of pleasant holidays.

1. Only you can prevent some fires

2. Winter weather brings new hazards to streets and sidewalks

3. Gifts that are used correctly and courteously give more pleasure

E. Rocks are grouped according to the type of formation

1. The tree groups of rocks are ingenous, sedimentary and metamorphic

2. Igneous rocks are generally believed to be the oldest group of rocks

3. There are many kinds of rocks with different characteristics

4. The hardness of a rock can generally be determined by a scratch test

5. When conditions are right, the particles which make up a mineral may arrange themselves in patterns which form flat-faced, regular shaped solids called crystals

6. Examine different kinds of rocks with a magnifying glass

7. Make a collection of minerals found in your state

8. Make a map showing the important mineral deposits in your state

F. Mountains are awe-inspiring and interesting features of the earth's surface

1. Mountains have basic processes by which they are formed

2. Mountains are classified according to their external appearance

3. Mountain climbing is a hobby

4. Mountains afford wonderful recreational areas

5. Mountains are being exploited

G. The polar regions are located at the ends of the earth

1. The polar regions are always icy cold

2. The polar regions affect our weather

3. Icebergs are formed in the polar regions

4. Plants and animals grow in the polar regions

5. The igloo is the basic dwelling of the Eskimo

6. Many caribou live on the tundra

7. The warlus spends much time in the cold arctic seas

8. The lemming is a small animal

9. The polar bear is a large white bear

H. All things that live in the forest, large and small, are linked together in a delicate balance between survival and the threat of disaster

1. The forest changes as the seasons change

2. The forest floor is a source of all life in the forest

3. The soil in the forest is either acid or alkaline, depending on the kind of rocks of which it is made

4. The plants of the forest add beauty to the area

5. Some of the animals depend upon their speed to escape

III

Experiences

A. Lesson Nine

1. Ask the students to look up the pattern of stars which make up Ursa Major.

2. Have some students look up the stories that are associated with the twelve constellations of the zodiac and present them before the class.

3. The twelve signs of the zodiac are those seen along the ecliptic during the year.

B. Lesson ten

1. Find out the day of the year that the sun's rays shine most directly on the place where you live.

2. Demonstrate in the classroom the different angles at which the sun shines upon the earth during one year. This represents the seasonal change.

3. Note the difference in the time of the rising and setting of the sun

4. Visit an observatory.

5. Visit a planetarium.

6. Observe the heavenly bodies with a transit (surveying instrument).

C. Lesson Eleven

1. Review the weather instruments and their uses.

2. Draw a large diagram of the movement of the air masses over the world.

3. Have a report on the solar storms given by some of the more advanced students.

4. Keep a weather calendar to record stormy weather conditions.

5. Visit the U.S. Weather Bureau. (Tupelo, Miss.)

6. Visit the airport to observe the weather instruments.

7. Invite a meteorologist to speak to the class.

D. Lesson Twelve

1. Demonstrate the proper way to use a fire extinquisher.

2. Experiment with a flash light to see which colors show up best at night.

3. Demonstrate hand signals and emphasize their use while riding a bicycle.

4. Secure pamphlets from your health department.

E. Lesson Thirteen

1. Demonstrate to the class how to give the "scratch test" to a rock.

2. Have a display of local rocks with identifications.

3. Ask a geologist to speak to the group.

4. Present reports of the economic value of rocks and soil of the local area.

5. Visit a museum to study rocks.

6. Grow several different crystals in the classroom.

7. Visit a monument company for rock samples.

F. Lesson Fourteen

1. Display various methods to illustrate a mountain forming

2. Prepare a volcano exhibit for classroom display.

3. Prepare a relief map to illustrate mountains or hills in local areas.

G. Lesson Fifteen

1. Develop a diorama or murial of the north polar region.

2. Develop a diorama or murial of the south polar region.

3. Demonstrate an iceberg by placing ice in a glass of water. Figure the amount of the ice that remains under water.

4. Construct a kayak.

5. Ask the students to bring in special reports of the life of the reindeer.

6. Ask the students to bring in a special report on the life of a huskie.

H. Lesson Sixteen

1. Take a field trip to a park or a woodland area to study the plant and animal areas.

2. Prepare a terrarium to illustrate the small plants and animals found in the woods.

3. Make a collection of the many leaves from trees in local forests.

4. Visit a sawmill to see the procedure followed in preparing trees for building purposes.

5. Make a list of the plants and animals found on the forest floor.

6. Ask a forest ranger to talk to the class.

LESSON NINE

I. CONCEPT

The constellations are groups of stars that seem to be a ranged in patterns.

II. OBJECTIVES

A. To understand why some constellations are given certain names.

B. To bring to mind relative motion of which the student may be familiar.

C. To explain why many of the constellations are seen only part of a year.

D. To learn to locate the more familiar constellations.

E. To understand the meaning of the word Zodiac.

III. PROBLEM

To acquaint the students with several easily found constellations with an understanding about some of the motions of the heavenly bodies.

IV MORE FUN

A. Books

1. Point to the Stars, Joseph Maron Joseph and Sarah Lee Lippencott
2. The Telescope, Harry Neal
3. The Adventure Book of the Stars, Thomas D. Nicholson
4. A Dipper Full of Stars, Lou Williams Page
5. Find The Constellations, H.A. Rey
6. You Among the Stars, Herman and Nina Sneider
7. Stars, Robert H. Baker and Herbert S. Zim
8. All About the Stars, Anne Terry Whute
9. Windows in the Sky, Homer E. Newell
10. How Big is Big, Herman and Nina Sneider

B. Films
   1. Beyond Our Solar System, Coronet
   2. Depths of Space, Int. Screen
   3. Exploring the Universe, EBF
   4. The infinite Universe, Almanac
   5. The Sun's Family, YAF
   6. Understanding Our Universe, Coronet
   7. Explorer in Space, UWF

C. Filmstrips
   1. Fun With Stars, Popular Science
   2. The Sky Above Our Earth, SVE
   3. What is In the Sky?, Curr.
   4. Information from Satellites, Film for Ed.

LESSON TEN

I. CONCEPT

Many years of human effort have gone into the science of telling time.

II. OBJECTIVES

A. To learn that the turning of the earth causes the sun to appear to rise and set every twenty-four hours.

B. To understand the divisions of the earth into latitude and longitude so as to have an understanding of locations on the earth.

C. To understand the convenience of time zones.

D. To introduce the history of time

E. To create curiosity concerning the timing of the heavens

III. PROBLEM

To cause an understanding of the time we devise from the heavenly bodies.

IV. MORE FUN

A. Books

1. The Seasons, Dereck Jervis
2. True Book of Seasons, Illa Padendorf
3. About Four Seasons and Five Senses, Ruth Radlauer
4. Spring Is Here, Dorothy Sterling
5. We Read About Earth and Space, Harold Tannenbaum and Nathan Stillman
6. The First Book of Time, Jeanne Bendick
7. Clocks Tell The Time, Alma K. Reck

B. Films
   1. Our Big Round World, Coronet
   2. The Seasons of the Year, Coronet
   3. Shadows on Our Turning Earth, Film Associates of California
   4. Depths of Space, ISP
   5. Exploring the Universe, EBF
   6. The Infinite Universe, SFL
   7. Solar System, ISO
   8. The Sun's Family, AF

C. Filmstrips
   1. All my Seasons, McGraw-Hill
   2. Daytime and Nighttime, McGraw-Hill
   3. The Seasons, EBF
   4. Seasons, SVE
   5. Finding Out About Day and Night, SVE
   6. The Earth In Motion, FH

LESSON ELEVEN

I. CONCEPT

Great air masses are caused by the movement of heavenly bodies in relationship to each other.

II. OBJECTIVES

A. To introduce the students to air masses and jet streams.

B. To cause an understanding of the development of the great winds.

C. To learn that certain topographical features such as mountain ranges and large bodies of water affect weather greatly.

D. To learn that weather changes at cold fronts are usually more violent than weather changes at warm fronts.

E. To create an understanding of the causes of the movement of the great winds.

F. To learn of the economic importance of understanding the nature of the winds movements.

G. To create an interest in the movement of air currents.

III. PROBLEM

To cause the student to have an understanding of the contributing factors to our air movement and the final results.

IV. MORE FUN

A. Books

1. Thunderstorms, Thelma Harrington Bell
2. The Wind - Nature's Great Voice, Ethel M. Campbell
3. Exploring the Weather, Roy A. Gallant
4. Weathercraft, Athelstan Spilhaus
5. All About the Weather, Ivan R. Tannehill
6. The First Book of Weather, Rose Wyler
7. Let's Go To a Weather Station, Louis Wolfe
8. The Book of Storms, Eric Sloane

9. Who's Afraid of Thunder, Howard E. Sandman
10. Everyday Weather and How It Works, Herman Schneider
11. Goodby Mr. Thunderstorm, Dorothy Marino
12. Hurricanes, Tornadoes, and Blizzards, Kathy Hitte

B. Films
1. Thunder and Lightning, YAF
2. Winds and Their Causes, Coronet
3. When Air Masses Meet, Cence Educational Films

C. Filmstrips
1. What is Wind?, JH
2. Basic Weather, SVE
3. Story of a Storm, Coronet
4. Thunderstorms, Curr F.
5. Air, Wind, and Weather, Eye Gate
6. Wind, FH
7. Why Does the Wind Blow?, SVE

LESSON TWELVE
(Interrelated)

I. CONCEPT

An ounce of prevention is worth a pound of cure.

II. OBJECTIVES

A. To inform the students of the laws concerning the possible Christmas gifts.

B. To call attention to safety measures concerning Christmas decorations.

C. To be thoughtful of others when enjoying the holidays.

D. To use safety measures indoors and out of doors.

III. PROBLEM

To cause an awareness for the necessity of obeying laws and safety measures at all times.

IV. MORE FUN

A. Books
1. First Book of Fireman, Bill and Rosalie Brown
2. The Forest Firemen, Bill and Rosalie Brown
3. Fire in Your Life, Irving Adler
4. Fire, Bertha M. Parker
5. Watch Your Step, J.J. Floherty

B. Films
1. Fire, Gateway
2. Fire Safety is Your Problem, McGraw-Hill
3. Fire, EBF
4. Preventing and Controlling Fire, YAF
5. Understanding Fire, Coronet
6. Growing Up Safely, Mississippi State Board of Health
7. Home Accident Hazards, Mississippi State Board of Health

C. Filmstrips
   1. Bicycle Safety, Curr F
   2. The Safe Way to School, JH
   3. Safety on a Bicycle, YAF
   4. We Make Some Safety Rules, YAF

LESSON THIRTEEN

I. CONCEPT:

There are many kinds of rocks with different characteristics.

II. OBJECTIVES

A. To review the main types of rocks

B. To review the formation of rocks

C. To organize the collecting of rocks.

D. To learn of tools and their use in rock collecting.

E. To learn to identify some of the more common rocks.

F. To learn to arrange a rock collection.

G. To create interest in the rocks in Mississippi.

H. To develop an interest in the economic importance in the rocks of our area.

III. PROBLEM

To present instructional material so that the student will be able to successfully begin a rock collection

IV. MORE FUN

A. Books

1. What is A Rock, Boleslaus John Syrochi
2. What is A Rock, Irvin and Ruth Adler
3. The First Book of Stones, Maribelle B. Cormack
4. The Adventure Book of Rocks, Eva Knos Evans
5. Rocks and Minerals, Irvin Roberts
6. Rocks, Rivers and the Changing Earth, Herman and Nina Schneider
7. The Story of Rocks, Dorothy Shuttleworth
8. Rocks All Around Us, Anne Terry White
9. Rocks and Their Stories, Mildred And Carroll Fenton
10. Rocks and Minerals and the Stories They Tell, Robert Irvin

11. My Hobby is Collecting Rocks and Minerals, David Jensen
12. The True Book of Rocks and Minerals, Illa Podendorf
13. Stories in Rocks, Henry L. Williams
14. Diamonds, Herbert S. Zim
15. The California Gold Rush, Mary Y. McNeer
16. The Story of Geology, Jerome Wyckoff

B. Films
1. Earth's Skin, AIF
2. Fossils are Interesting, FAC
3. Minerals and Rocks, EBF
4. Rocks and Minerals, FAC
5. Rocks for Beginners, JHP
6. Understanding our Earth, Rocks and Minerals, Coronet

C. Filmstrips
1. Our Earth Seried, JH
2. Rocks and How They Change, FH

LESSON FOURTEEN

I. CONCEPT

Mountains are the highest areas on the earth.

II. OBJECTIVES

A. To learn the several basic processes by which mountains are formed.

B. To learn the several classes of mountains.

C. To review the types of rocks.

D. To learn of the mountains in the United States.

E. To create interest in mountain building.

III. PROBLEM

To cause an understanding of the basic processes by which mountains are formed and to learn some of the outstanding mountain ranges.

IV. MORE FUN

A. Books
1. The Earth for Sam, W. Maxwell Reed
2. About the Planet Earth, Patricia Lauber
3. Our Earth, Frederick H. Pough
4. The Earth's Story, Gerald and Rose Wyler Ames
5. Rocks All Around Us, Anne Terry White
6. The Story of Archeology in the Americas, Mary Elting and Franklin Folsom
7. Volcanoes and Earthquakes, Robert Irvin
8. Volcano, Walter Buehr
9. About Caves, Terry Shannon

B. Films
1. Birth and Death of Mountains, FA
2. Earthquakes and Volcanoes, FA
3. Oceanography: Science of the Sea, FA
4. What's Under the Ocean, FA

5. What's Inside the Earth, FA
6. Our Earth, Cenco
7. Mammals of the Rocky Mountains, Coronet
8. Mountain Building, EBF

C. Filmstrips
1. Changing the Face of the Earth, SVE
2. Wind and Waves, SVE
3. Volcanoes and Earthquakes, SVE
4. Mountains, SVE
5. The Earth's Diary, SVE
6. Work of Ground Water, SVE
7. Work of Internal Forces, SVE
8. Our Earth: Land, Water, and Air, SVE
9. The Story of Mountains, EBF

LESSON FIFTEEN

I. CONCEPT

There are many interesting things within the boundaries of the polar region

II. OBJECTIVES

A. To acquaint the student with the location of the polar regions.

B. To learn of the life near the poles.

C. To learn of the history of the polar regions.

D. To learn of the recent developments in the polar regions.

E. To create interest in the polar regions.

F. To become aware of the economic importance of the polar regions.

III. PROBLEM

To cause an understanding of the climatic conditions in the arctic region and the special adjustments necessary to live in the environment.

IV. MORE FUN

A. Books
1. The First Book of Eskimos, Benjamin Brewster
2. The Eskimo Hunter, Florence Hayes
3. Miss Pickerell Goes to the Arctic, Ellen MacGregor
4. Etuk, the Eskimo Hunter, Miriam MacMillan
5. Life in the Arctic, Herman and Nina Schneider
6. The Story of the Ice Age, Rose Wyler and Gerald Ames

B. Films
1. Giants of the North, Bray
2. Arctic Borderland in Winter, Coronet
3. Understanding Our Earth: Glaciers, Coronet
4. Geological Work of Ice, EBF

LESSON SIXTEEN
(Interrelated)

I. CONCEPT

Life in the forest can be beautiful.

II. OBJECTIVES

A. To learn about the main forest regions in the United States.

B. To encourage the children to investigate trees and their characteristic features.

C. To acquaint the children with various enemies of the forest, as well as measures which are taken to counteract those enemies so there will be forests in the future.

D. To discover the many forms of life that live in the forest.

E. To learn the economic importance of preserving our forests.

F. To create an interest in conserving our natural resources.

III. PROBLEM

To bring about an understanding of the many life activities that are present in a forest and learn ways to preserve the natural resources.

IV. MORE FUN

A. Books

1. See Through the Forest, Millicent Selsam
2. Trees, Herbert S. Zim and Alexander C. Martin
3. Wonders of the Woodland Animals, Jacquelyn Berrill
4. Wild Folk in the Woods, Carroll L. Fenton
5. Gifts from the Forest, Gertrude W. Wall
6. Thanks to Trees, Irma Webber
7. Lookout for the Forest, Glen O. Blough
8. The Friendly Forest, Alma C. Moore
9. Your Forest, Martha B. Veuwew
10. The First Book of Trees, Maribelle B. Cormack

B. Films
   1. Plants and Animals in Their Natural Environments, SVE
   2. Forest Grows, EBF
   3. Forests and Conservation, Coronet
   4. Your Friend the Forest EBF
   5. Common Animals of the Woods, EBF
   6. Life in the Forest, EBF
   7. Birds of the Woodlands, Coronet
   8. Jungle Giants, TFC

C. Filmstrips
   1. Forest Resources, Curr F.
   2. Grow Trees for Tomorrow, PDP
   3. Why Trees Are Important, PDP
   4. Wildlife Conservation Set, (4 filmstrips) SVE

UNIT THREE

PLANTS

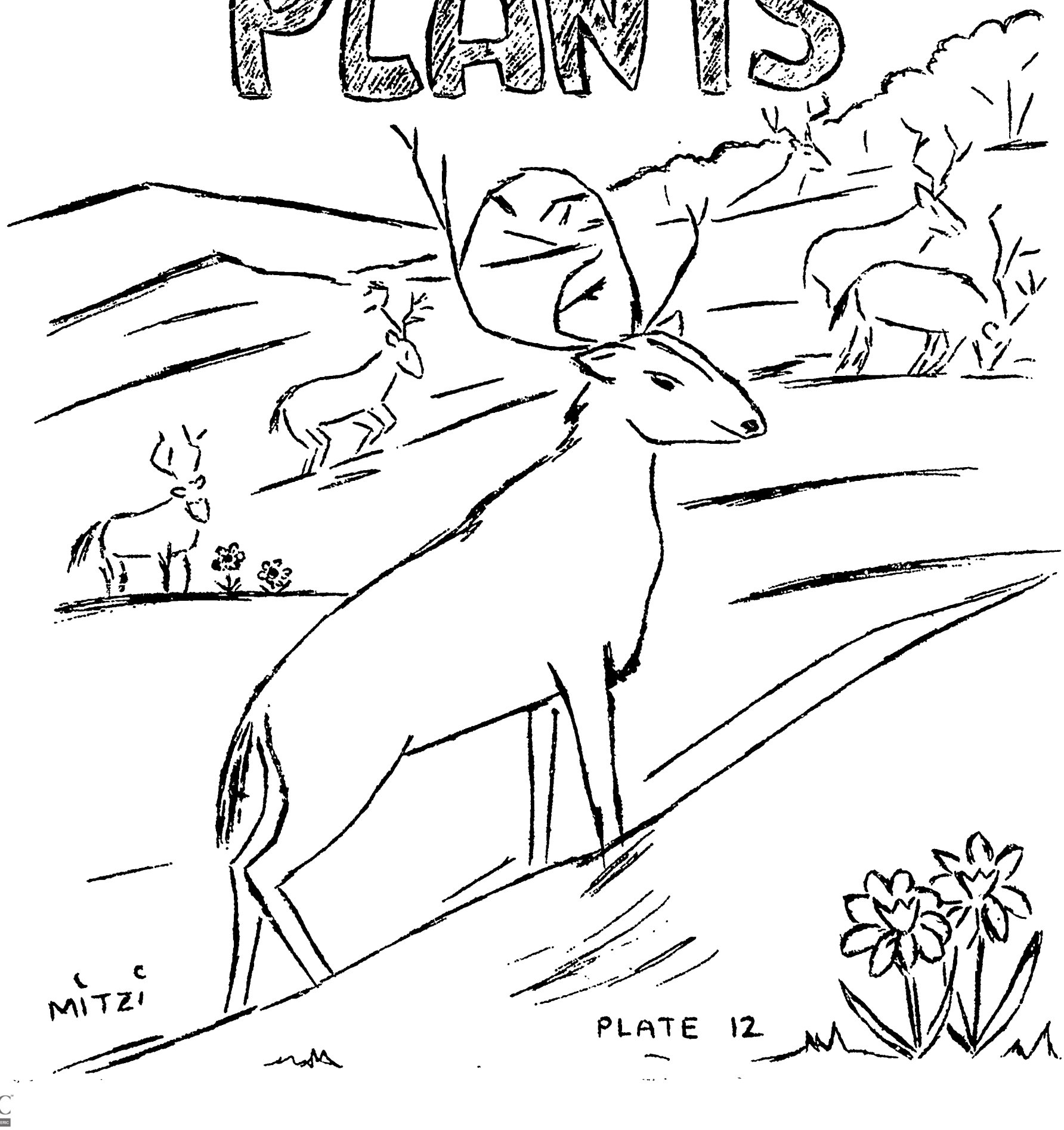

PLATE 12

UNIT THREE

LIVING THINGS

PLANTS

I

Introduction

Non-green plants play a much more important role in the world than most people realize. Many of them such as yeast and bacteria, are microscopic, but due to their number they have a marked effect on other living things. Hand lens are desirable for examining some of the smaller forms. Many experiments with bacteria should suggest themselves to the pupils.

The purpose of this lesson is to further the study of flowering plants. This discusses the seed-bearing plants showing the two main groups, the gymnosperms and the angiosperms, their growth, enemies, care and use.

Flowers are often thought of as being ornamental only. This lesson shows how the flowers function in the production of seeds and fruits; a study of plant reproduction by means of flowers. This area of study encourages field observations. Identification for identification's sake is not stressed. Pupils are given suggestions of things to look for in the many flowers they will encounter during the spring.

A study of the interrelationship of plants and animals and their environment is further emphasized by looking into specific examples to find reasons for their behavior. Mystery lurks behind the movement of some of our most familiar animal friends. Whatever animal it may be, their comings and goings are often unique and sometimes unbelievable.

This study suggests strongly that everyone give thought to the right actions to take in case of an emergency. It will help each of us to recognize our responsibilities for preventing emergencies and preparing to do the right thing when meeting situations that may be unavoidable.

II

Major Concepts

A. Bacteria are classified as plants by their structure

1. Non-green plants are dependent upon other organisms for their food

2. Non-green plants are dependent upon favorable conditions in their environment for survival

3. Non-green plants grow and reproduce rapidly in a favorable environment

4. Some non-green plants are helpful while others are harmful

5. Bacteria are the smallest of the fungi

6. Most bacteria are harmless or may be useful to man

7. A few bacteria are harmful to man

8. Bacteria are found almost everywhere

9. A powerful microscope must be used to see the individual bacteria organism

B. There are certain factors that affect the growth of trees and the maintenance of forests

1. There are conditions that affect the value of trees for lumber

2. Trees are of great value in recreation

3. Trees have certain methods by which they grow

4. Some trees shed their leaves in the winter

5. Conservation of our trees is important

C. Flowers play an important part in the life of man

1. Some parts of a flower are essential for the production of seeds

2. Pollination is the first step in the production of seeds

3. There are special adaptations for pollination.

4. There are many kinds of fruits

5. Fruits and seeds are adapted for dispersal

6. Fruits have great economic value

D. All members of a family should be trained in safe emergency procedures

1. You will need expert information to plan an emergency program

2. Accidental poisoning is an emergency

3. Some traffic hazards could be prevented by careful planning

4. Often fires could be prevented if safety measures were followed.

5. All people should have a personal emergency plan

E. The mysteries of migration are many

1. Many migrations take place on land

2. Some migrations take place in the air

3. Some of the animals migrating are seafarers

4. The reasons for the migrations are numerous

III

Experiences

A. Lesson Seventeen

1. Aska qualified person from the hospital to permit you you to visit the laboratory in the hospital.

2. Prepare several sterilized dishes in which gelatin and beef broth have been prepared. Expose them to several different conditions and observe. Keep a record of the findings.

3. Take a field trip to the woods or park and locate as many dependent plants as you can find.

4. Learn to make mushroom prints.

B. Lesson Eighteen

1. Collect leaves of trees and dry them between sheets of newspaper under pressure. Mount the leaves and properly label them.

2. Ask a forester to speak to the class about methods used to protect the forests of your area.

3. Visit a sawmill and write a report of the interesting things you saw.

4. Find out the proper method of building and putting out campfires. Demonstrate the method to the class.

5. Study the growth of branches by making cuts both crossways and lengthwise of branches.

C. Lesson Nineteen

1. Take apart different kinds of flowers to find the pistils and stamens. Make charts showing the different kinds and numbers of these flower parts that you find.

2. Look at pollen grains with a microscope and draw the different kinds.

3. Soak a piece of cotton in sugar water and place in a container with a butterfly. Watch the butterfly roll out its tongue to drink.

4. Make a drawing of a flower as it develops from day to day.

5. Cut open different kinds of fruit to see the arrangements of the seeds.

6. Collect and press flowers between sheets of newspaper placed under heavy weights. Mount the flowers on sheets of heavy paper.

D. Lesson Twenty

1. Ask someone from the Red Cross Office to speak to the students on safety.

2. Visit the local hospital and observe the arrangement they have to accomodate emergencies.

3. Ask a fireman to talk to the class about the part that firemen play in an emergency.

4. Make a list of things that you would do in case of certain emergencies.

5. Visit the firestation.

E. Lesson Twenty-One

1. Observe the migration of birds through the area.

2. Ask some one from the United States Department of Interior to discuss the movement of animals.

3. Ask for reports of local migrations.

4. Plot the routes that certain animals take in their travels.

5. Collect clippings from magazines and local papers concerning the strange appearances of animals in an area.

LESSON SEVENTEEN

I. CONCEPT:

Bacteria possess a cell membrane plus a thickened cell wall that enables us to classify them as plants.

II. OBJECTIVES

A. To review the non-green plants

B. To cause an awareness of the ever presence of helpful and harmful bacteria.

C. To study the life cycle of one representative bacteria

D. To impress the students of the importance of keeping accurate records of their experiments

E. To emphasize the harmful bacteria and some helpful bacteria.

F. To create an interest in bacteriology.

G. To learn the kinds of bacteria.

III. PROBLEM:

To acquaint the student with the characteristics and the importance of bacteria.

IV. MORE FUN

A. Books

1. Microbes at work, Millicent E. Selsam
2. Wonder World of Microbes, Madeleine Grant
3. Life Under A Microscope, William Hutchinson
4. First Book of Microbes, Lucia Z. Lewis
5. Lens Magic, Frances Rogers
6. Through the Magnifying Glass, Julius Schwartz
7. Men, Microscopes, and Living Things, Katherine Shippen

8. Magic Bullets, Louis, Sutherland
9. Wonders Under A Microscope, Margaret Cosgrove
10. Lets Look Under The City, Herman and Nina Schneider
11. Story of Microbes, S.R. Riedman
12. Miracle Drugs and the New Age of Medicine, Fred Remfeld.
13. Plants that Heal, Millicent Selsam

B. Films
1. Bacteria, EBF
2. Microscopic Life, EBF
3. Why Foods Spoil, EBF
4. Fungus Plants, EBF
5. Microscopic Life: The World of the Invisible, EBF
6. Mold and Yeast, EBF
7. Miracle From Mold, Sterling
8. Simple Plants: Bacteria, Coronet
9. Bacteria: Friend and Foe, EBF
10. Life in a Cubic Foot of Air, Coronet
11. The cell- Structural Unit of Life, Coronet
12. Cheesemaking in Dairyland, Damrow Brothers

C. Filmstrip
Through the Microscope, Popular Science

LESSON EIGHTEEN

I. CONCEPT

Trees are important to us in many ways.

II. OBJECTIVES

A. To learn how a tree grows

B. To learn different kinds of trees with different characteristics

C. To learn how to protect our trees

D. To learn of the economic importance of lumber

E. To learn of local trees.

F. To become aware of the importance of controlling fires in our forests

G. To create interest in caring for our trees

H. To help pupils appreciate the importance of forests in protecting our watershed

III. PROBLEM:

To present an opportunity for the students to learn of the local trees and their function.

IV. MORE FUN

A. Books
1. Wait for the Sunshine, Glenn O. Blough
2. The First Book of Trees, Maribelle B. Cormack
3. Trees and Trails, Clarence John Hylander
4. Indian Harvest, Jannette, Lucas
5. What Tree Is It?, Anne Pistorius
6. True Book of Trees, Illa Podendorf
7. The Wonders of Seeds, Alfred, Stefferud

8. Trees and Their Story, Dorothy Sterling
9. Play With Trees, Millicent E. Selsam
10. Bits That Grow Big, Irma E. Webber
11. Trees and Their World, Carroll L. Fenton and Dorothy Pallas
12. Big Tree, Conrad and Mary Buff
13. The Forest, Peter Farb
14. The Forestry Story, George Shaftel and Helen Hefferman

B. Films
1. Plant - Animal Communities: The Changing Balance of Nature, Coronet
2. Plant - Animal Communities: Interrelationships, Coronet

C. Filmstrips
1. The Lumber Mill, Curr F
2. Making Maple Syrup, Curr F
3. Forest Resources, Curr F
4. Forests, British Columbia, Curr F
5. Forest, protecting from Fire

LESSON NINETEEN

I. CONCEPT:

Flowers function in the production of seeds and fruits

II. OBJECTIVES:

A. To review the parts of a flower and the function of each

B. To consider some of the methods of pollination

C. To learn of the growth of the parts of a flower

D. To develop an appreciation for the beauty of the flowers

E. To become aware of the economic importance of the part a flower plays in our lives

F. To cause an understanding of the necessity of conservation of wild flowers

III. PROBLEM:

To create a realistic attitude toward flowers concerning their primary function

IV: MORE FUN

A. Books

1. The First Book of plants, Alice Dickinson
2. Plants of Woodland and Wayside, SuZan Swain
3. Look at a Flower, Ann Ophelia Dowden
4. This Green World, Rutherford Platt
5. Play with Plants, Millicent E. Selsam
6. Plants: A Guide to Plant Hobbies, Herbert S. Zim
7. Plants In The City, Herman and Nina Schneider
8. See Through The Jungle, Millicent E. Selsam
9. Play with Leaves and Flowers, Millicent E. Selsam
10. Flowers, Herbert S. Zim and Alexander Martin
11. All About Our Flowering World, Ferdinand C. Lane
12. The Flower, Mary Louise Downer

B. Films
   1. Garden Plants and How They Grow, Coronet
   2. Life From the Sun, IFB
   3. Growth of Flowers, Coronet
   4. Flowers at Work, EBF

C. Filmstrips
   1. Flowers, Fruits, Seeds, SVE
   2. Plant Factories, SVE
   3. Plants in My Garden, EGF
   4. Plants in the Park, EGF
   5. How Flowering Plants Grow and Reproduce, SVE
   6. Parts of a Flowering Plant, Curr F
   7. Structure of Plants, EBF
   8. American Wild Flowers, VAF

LESSON TWENTY
(Interrelated)

I. CONCEPT:

Whether mammal, bird, insect or fish, their strange partners and their comings and goings are often unique and sometimes unbelievable.

II. OBJECTIVES:

A. To cause an understanding of some of the problems and solutions of overpopulations

B. To bring to the attention some of the unsolved mysteries surrounding us

C. To reemphasize the relationship of one thing to another

D. To create an interest in the many happenings in nature surrounding us

E. To cause an awareness of the many movements of many kinds of animals

F. To learn of certain movements on land, sea, and in the air

G. To study the theories as to why these many movements take place

H. To learn the routes that certain groups of animals follow on their journey

I. To formulate some idea as to the reasons the movements take place

J. To understand the economic problem developed because of the movement of animals

III. PROBLEM

To cause an awareness of mysterious sporatic migrations and some explanation as to their cause

IV. MORE FUN

A. Books

1. Strange Travelers, Sigmund Lavine
2. Bird and Butterfly Mysteries, B. Acworth
3. The Locust, Harry F. Bailey
4. Great Migrations, George Blan
5. Emigration, Migration and Nomadism, Walter Heape
6. Migration of Fish, Alexander Meek
7. Migration of animals from Sea to Land, A.S.Pearse
8. The Migration of Butterflies, C.B. Williams

B. Filmstrips

The Migration of Birds, SVE

LESSON TWENTY-ONE

I. CONCEPT:

In every emergency there are correct actions to take.

II. OBJECTIVES:

A. To help individuals meet emergencies with a plan

B. To help to educate the public in closing the gap between what experts know about preventing or minimizing illinesses and injuries, and what most laymen do not know about the imperatives of proper emergency care

C. To create public interest in learning as to the things that must be done to prevent or minimize injuries and illiness to millions of Americans

D. To enlist public support in further activities concerning health and emergencies

III. PROBLEM:

To cause the student to be aware that a plan should be worked out to meet emergencies

IV. MORE FUN:

A. Books
1. Safety Education, A.E. Florio
2. First Aid Textbook for Juniors, Red Cross
3. First Aid Text Book, Red Cross
4. National Red Cross First Aid Textbook, Red Cross

B. Films
1. Safe Driving: Techniques of The Skilled Driver, Coronet
2. Working Safely In The Shop, Coronet
3. Safe Driving, The Defensive Driver, Coronet

C. Filmstrips

1. Keeping Ourselves Healthy, Curr F.
2. Safety To and From School, Curr F
3. Safety At School, Curr F
4. Safety At Home, Curr F
5. Safety in the Summer, Curr F
6. The Intermediate Safe Way Set, SVE

UNIT FOUR

MATTER, ENERGY, AND MACHINES

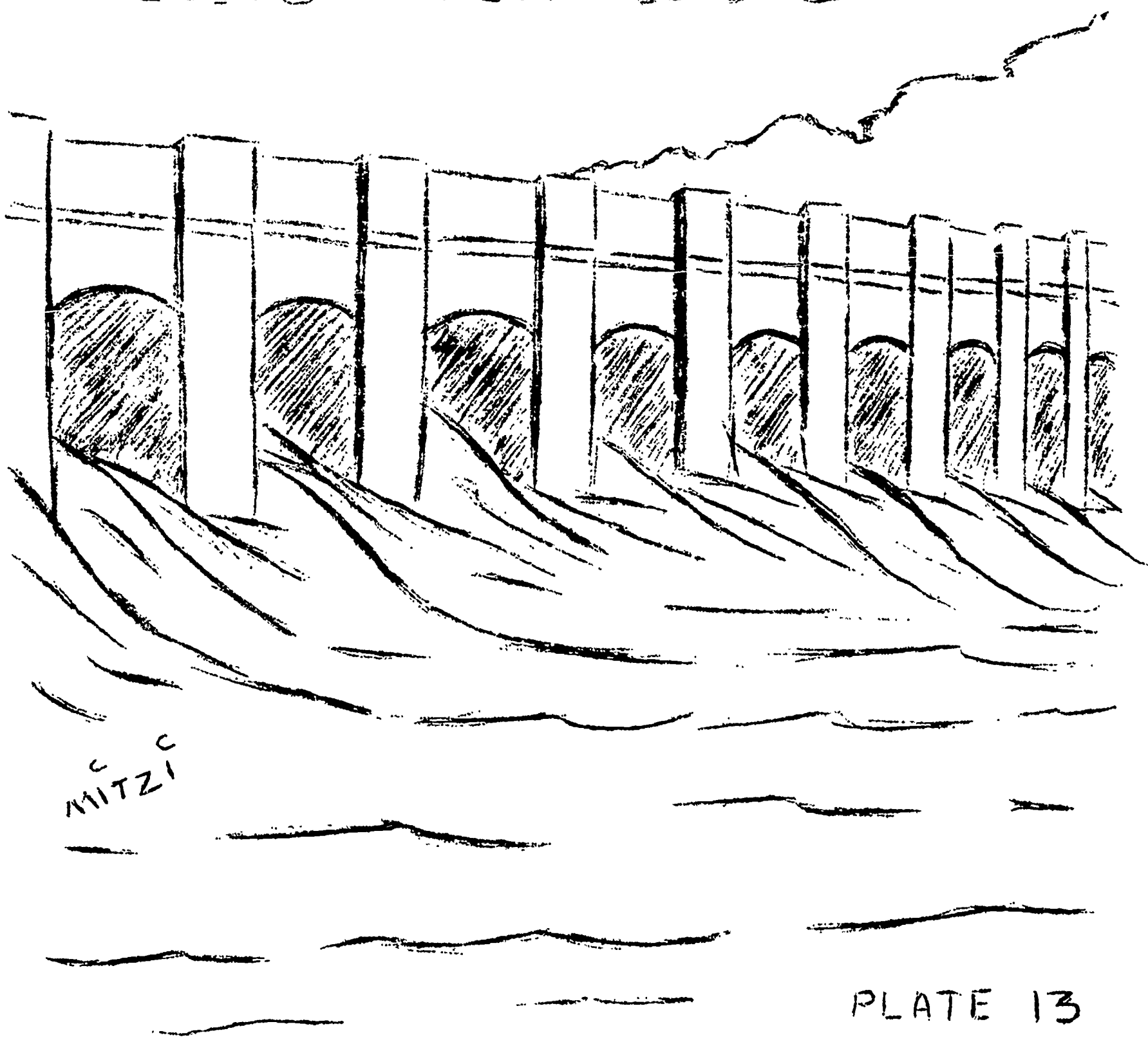

PLATE 13

UNIT FOUR

MATTER, ENERGY, MACHINES

I

Introduction

The unique chemical and physical properties of water are related to its molecular structure. In this lesson, students will learn more about the arrangement of the atoms in the molecule and how the arrangement is related to some of the characteristics of water. Students will begin to understand many of the characteristics they have taken for granted for so long.

Although this field of science, energy and matter, may be somewhat foreign to many adults, it is taken for granted by contemporary youngsters. Nuclear energy will become increasingly important as an energy source in the future. Reactors are being constructed and will soon be generating electrical energy.

The control of nuclear energy as a source of energy has yet to be accomplished. It is hoped that control will be attained during these student's lifetime. Hence, it is important to understand both the fission and fusion reactions.

In this lesson students will learn how chemical, mechanical, and radiant energy can be used to move electrons thus producing electrical energy. The operation of some of these converters is discussed, and there is an introduction to their practical value.

The following lesson will help the students understand the relationship between the different forms of radiant energy and matter. It is a follow-up of lessons studied about reflection, refraction, transmission, and absorption of radiant energy. Here the student will think of the cause and effect relationship between radiant energy and matter.

In this study students learn of the ways in which men commute with one another. Students will learn the functions of the lips, teeth, and tongue in the formation of special sounds. They will learn that one really hears with the brain, not with the ears, as well as that only man is capable of producing and understanding complex patterns of speech.

Here we study the complex machines and understand the reasons why work output of a machine is always less than the work input. Mathematics is used to explain some of the related concepts, that is the efficiency of a machine.

Naturally, as we near the close of a program of study our thoughts turn to things that are closer and dearer to us, our Mississippi. This lesson delves into the history of the Old South. Here we study the many factors effecting plant distribution, animals and their environmental requirements, man's uses of the natural environment and the return to a natural environment as represented by the Natches Trace Parkway.

The last lesson is a review or an evaluation of the program for the year. Outstanding information covered during the year will be recalled to memory.

II

Major Concepts

A. Water has certain characteristics

1. Water is colorless, tasteless, and odorless.

2. Water has the chemical formula, H_2O

3. Water has one unusual characteristic, it expands when it freezes.

4. Water is sometimes called the "universal solvent".

B. Man's successful survival and his standard of living depend greatly on his ability to use and control energy.

1. Matter can be changed physically, during which its state, size and shape is changed.

2. Matter can be changed chemically, during which its molecular structure is altered.

3. Chemical changes may involve different kinds of chemical reactions

4. Machines are able to change energy from one form to another

5. Energy comes from matter

6. Energy is released during chemical reactions

C. We are now living in the nuclear age.

1. The particles that make up atoms are composed of forms of energy

2. Sometimes some of the binding energy of the atom is released

3. Sometimes the binding energy is released from an atom as particles of radiant energy

4. Madam Curie discovered radium

D. Electrical energy is generated when some other form of energy is expended.

1. In a battery the chemical energy is changed into electrical energy.

2. An electric cell generates current electricity

3. A hydroelectric plant uses the energy of falling water to produce electrical energy.

4. Safety rules must be followed where electricity is present.

5. High-voltage but very small currents is safe

6. Large current but very small voltage is safe.

7. High voltage and large currents are <u>DANGEROUS</u>

E. Light and other forms of radiant energy travel in the form of waves at a speed of 186,000 miles a second

1. Light travels in a straight line from the source

2. Radiant energy can be absorbed, reflected, transmitted and refracted.

3. Light is the only form of radiant energy we can see

4. Other forms of radiant energy, other than visible light are, radio and television waves, infra red waves, ultra violet waves, X-rays, and gamma rays.

5. Different forms of radiant energy make up the electromagnetic spectrum.

F. Sound is produced by vibrating bodies.

1. Sound waves travel through all forms of matter but not through a vacuum.

2. The rate at which a body vibrates is affected by its length, thickness and tension

3. Sound waves can be recorded and later reproduced

4. The vocal cords are muscles that vibrate when air moves over them

5. The teeth, lips and tongue help form sounds.

6. The ears receive the sound waves.

7. The brain interprets the sound waves that the ear hears.

G. Complex machines are combinations and modifications of a few simple machines.

1. The amount gotten out of a machine does not exceed the amount of energy put into it.

2. Machines may increase force, increase speed, or change direction.

3. When effort force is increased, distance is lost.

4. Complex machines multiply the forces of the simple machines of which they are combinations.

5. Friction increases effort that must be applied, and decreases speed (distance).

6. Friction is a force that resists motion.

H. Mississippi has many natural beauties.

1. The growing seasons are long in Mississippi.

2. The Natches Trace Parkway is a long National Park located partially in Mississippi.

3. Mississippi has many beautiful trees and flowers.

4. The Magnolia is the state flower of Mississippi.

5. The Mockingbird is the state bird of Mississippi.

I. Evaluation is an important step in progress.

1. Summation of work helps discover the best areas of a program.

2. Summation of work helps discover areas that should be included in a program.

3. Summation of work helps discover the best presentation of subject matter.

4. Summation of work aids in bettering a program for future use.

III

Experiences

A. Lesson Twenty-two

1. Experiment with mercury on glass. Decide whether the force of cohesion or adhesion in the molecule is greater.

2. Experiment floating a needle on hot water and cold water . Discuss surface tension.

3. Observe the behavior of water insects that can walk on the water.

4. Observe the shape of the drops of water dropped from different shaped containers.

5. Experiment with water dissolving certain substances. What is the difference in the rate at which they dissolve?

6. Experiment by freezing water, then solutions of certain materials. What causes the difference?

B. Lesson twenty-three

1. Grow certain crystals to experiment with different changes.

2. Prepare a display of certain physical changes.

3. Bring some windup toys to school. Trace all the energy changes that are possible.

4. Ask the students to survey their homes to list as many energy changes as possible.

5. Demonstrate in the classroom, under the supervision of the teacher, how to control a fire.

C. Lesson Twenty-Four

1. Have students learn the parts of the atom.

2. Have the students learn some of the more familiar elements.

3. Let the students draw some of the atoms of the simpler elements.

4. Plant seeds from a biological supply house that sells packets of seeds that have been exposed to radiation.

5. Clip articles from the papers concerning radioactive elements.

6. Write a report about Madam Curie.

D. Lesson Twenty-Five

1. There is a major "hydro-electric" generating plant at Pickwick Dam near Counce, Tennessee, and at Wilson Dam near Florence, Alabama. There is a large steam electric generating plant near Cherokee, Alabama. These plants are on the Tennessee River, and visitors are welcome. If you have an opportunity, visit a plant and learn what you can about the number and size of the generating units, the switch yard, etc.

2. On trips you may have noticed transmission lines strung on large towers rather than poles. These are high voltage lines. What are their purposes? Why are the lines hung on long insulators? Why are they so high in the air? Have you ever noticed where these lines terminate?

3. Observe the "service drop" to your home. Follow this wire away from your home until you see the transformer on a pole. What is the purpose of the transformer?

4. Is your home near the point where the service drop is attachedto your service entrance switch and distribution panel? With an adult in your home, learn what you can about the size and purpose of this equipment. (The door of this panel may be safely opened but no attempt should be made to remove the cover.)

E. Lesson Twenty-Six

1. Plan a trip to a radio station or a television station. Ask the engineer to explain the fundamentals of broadcasting to the class.

2. Find out why stores no longer use X-ray machines to aid in fitting shoes. (A Doctor will be able to explain the reason.)

3. Ask a Citizens Band Radio operator, sometimes called "Ham" to speak to the class.

4. Ask a Doctor to speak to the class concerning the eye.

5. Visit a plant that makes light fixtures.

F. Lesson Twenty-Seven

1. Ask a voice teacher to explain how human voices are classified for singing.

2. Find out if your city has a law to control noise.

3. Tape your voice and listen to it being played back.

4. Ask a speech therapist to speak to your class.

5. Prepare a bulletin board illustrating some of the ways sound is used in daily life.

6. Experiment with a tuning fork creating sounds.

7. Have the students make a murial that shows the history of communications.

G. Lesson Twenty-Eight

1. Make several combinations of gear wheels, for example, one that multiplies speed by three, or multiplies force by two and one-half.

2. Prepare problems to be solved by using a pulley to observe or with which to experiment.

3. Prepare problems that will show the advantages or disadvantages of different oxle ratios to wheel ratios.

4. Experiment with the six types of machines. Work problems from observing the machines.

5. Visit Rockwell Manufacturing Company to see where machines are being used to make other machines.

H. Lesson Twenty-Nine

1. Visit a nature trail and record the different animals and plants that you saw.

2. Prepare feeding stations for animals at your home.

3. Do something constructive toward keeping Mississippi a beautiful place to live.

I. Lesson Thirty

1. Evaluate the work for the year by displaying materials made or collected.

2. Ask the students to prepare illustrations to explain their favorite subject during the year.

LESSON TWENTY-TWO

I. CONCEPT:

Water has unique chemical and physical properties that are related to its molecular structure.

II. OBJECTIVES:

A. To learn more about the arrangement of the atoms in the water molecule

B. To learn of some of the characteristics of the water molecule as it changes temperature

C. To better understand the action of molecules in surface tension and solvent activity

D. To give an understanding of many of the characteristics that students have been aware of but not understanding

III. PROBLEM:

To give a better understanding of the molecular movement of the water molecule

IV. MORE FUN

A. Books

1. Experiments in Chemistry, Nelson F. Beeler and Branley M. Franklyn
2. Discovering Chemistry, Elizabeth K. Cooper
3. All About the Wonders of Chemistry, Ira Freeman
4. Exploring Chemistry, Roy Gallant
5. Chemistry Creates a New World, Bernard Jaffe
6. Marie Curie, Robin McKowan
7. Elements: Builders of the Universe, Jerome S. Meyer
8. Deep Treasure - a Story of Oils, Elizabeth Olds
9. Through the Magnifying Glass, Julius Schwartz

B. Films

1. Chemical Changes All About Us, Coronet
2. How Materials Are Alike and Different, Coronet
3. What are Things Made Of?, Coronet
4. The Water Cycle, EBF
5. Explaining Matter: Atoms and Molecules, EBF
6. Explaining Matter: Molecules in Motion, EBF

C. Filmstrips

1. Some Things Dissolve, YAF
2. Understanding Chemical Change, YAF
3. The Atom: Man's Servant, EBF
4. Atoms and Molecules, SVE
5. What Things are Made Of, SVE

LESSON TWENTY-THREE

I. CONCEPT:

Changes take place in matter and energy.

II. OBJECTIVES:

A. To focus attention on physical and chemical changes

B. To introduce different kinds of chemical reactions

C. To learn ways in which energy may change forms.

D. To encourage the student to strive to learn to control and use energy to his benefit

E. To create an interest in the further study of matter

III. PROBLEM:

To cause the student to form basic understandings of the many changes that occur every day

IV. MORE FUN

A. Books

1. Let's Go to a Dam, Hamilton Lee
2. Fire In Your Life, Irving Adler
3. Atoms At Work, George P. Bischof
4. Flowing Gold: The Romance of Oil, John J. Floherty
5. All About The Wonders Of Chemistry, Ira Freeman
6. Atoms Today And Tomorrow, Margaret O. Hude
7. Young Peoples Book of Atomic Energy, Robert D. Potter
8. Aluminum, Miracle Metal, C.B. Colby
9. The Chemical History of a Candle, Michael Faraday
10. Atoms At Work, George P. Bischof
11. All About The Atom, Ira M. Freeman
12. Men And Women Behind The Atom, Sarah R. Riedman
13. Men And Women Behind The Atom, R. Riedman
14. Picture Book Of Molecules And Atoms, Jerome Meyer

B. Films

1. Making Glass For Houses, EBF
2. Wonders Of Chemistry, YAF
3. Atom Goes To Sea, Eyegate
4. Atom Smashers, EBF
5. Fire Science, Churchill-Wexler
6. We Make A Fire, EBF
7. Atom and Agriculture, EBF
8. The Nature Of Energy, Coronet

C. Filmstrips

1. Man Discovers The Atom, EBF
2. Our Friend, The Atom, EBF
3. The Atom, Almanac Film, Inc.
4. The Atom, LMF
5. Atom As You Will Use Them, Society For Visual Education

LESSON TWENTY-FOUR

I. CONCEPT

Without doubt, nuclear energy will become increasingly important as an energy source in the future.

II. OBJECTIVES:

A. To review the basic particles of matter

B. To become aware of the fact that nuclear energy is produced by changing the matter in the nucleus of the atom

C. To become aware that the nuclei of light atoms are combined to form nucleus of a heavy atom

D. To cause the student to understand some of the changes connected with "radioactive fallout."

E. To create an interest in the future possibilities that lie within the atom

F. To learn some controls of energy

III. PROBLEM:

To cause the student to think seriously concerning the energy that lies in the atom and the use it can be put to to help man.

IV. MORE FUN:

A. Books
1. Who Built The Dam?, Norma Bate
2. The Wonderful World Of Energy, Lancelot T. Hogben
3. Energy and Power, Robert Irving
4. Thank You, Mr. Sun, Hyman Ruchlis
5. A Boy And A Battery, R.F. Yates
6. The Story Of Power, Edward Stoddard

7. Young People's Book of Atomic Energy, Robert Potte
8. Atomic Submarines, John Lesellen
9. The Mighty Atom, Jonn Lewellen
10. More Power To You, Herman And Nina Schneider
11. Electronics For Young People, Jeanne Bendick

B. Films
1. Working Water, PDP
2. Water Works For Us, YAF
3. Energy, Gateway
4. Air In Action, Coronet
5. How We Get Our Power, YAF
6. Force Of Gravity, YAF

C. Filmstrips
1. Gravity, YAF
2. Gas Pressure At Work, Popular Science
3. How Heat Is Transferred, YAF
4. How Water Power Produces Electricity, PDP
5. Overcoming Gravity, McGraw-Hill
6. Why Things Float, YAF

LESSON TWENTY-FIVE

I. CONCEPT:

The electricity we use in our homes comes through a huge network of circuits originating with the central generating stations. It is transmitted through high voltage transmission lines to substations and then through distribution systems to our homes. Our household wiring is a part of this network and delivers the electricity to our individual lights and appliances.

Introduction : Many students and adults have little understanding of their own electrical systems (wiring) and the relationship between these systems and the larger generation and distribution network.

II. OBJECTIVES:

A. To understand the function of the generating plant, its transformer station, and the high voltage transmission system

B. To understand the function of the local "sub-stations" and electrical distribution system

C. To learn more about the function of the various components of our home electrical system

D. To gain a more complete understanding of electrical safety and the purpose of safety devices (fuses, insulation, etc.)

III. PROBLEM:

To learn how electricity is distributed so that it reaches all the lights and appliances in our homes

IV. MORE FUN:

A. Books

1. Experiments With Electricity, Nelson F. Beeler and Franklyn M. Branley
2. Mickey's Magnet, Franklyn Branley and Eleanor, Vaughan
3. The First Book Of Electricity, Sam and Beryl Epstein
4. All About Electricity, Ira M. Freeman
5. Picture Book Of Electricity, Jerome S. Meyer
6. Lets Lock Inside Your House, Herman and Nina Schneider
7. Lets Look Under A City, Herman and Nina Schneider
8. I Know A Magic House, Julius Schwartz
9. The Marvelous Magnet, Harry Sootin
10. Machines, Jerome S. Meyer
11. Rusty Rings A Bell, Franklyn M. Branley and Eleanor K. Vaughan
12. Mr. Bell Invents The Telephone, Katherine Shippen
13. The Story of Electricity, Mae Blacker Freeman and Ira M. Shepard
14. Electricity: The Story Of Power, Arnold Mandelbaum
15. Boys' Book Of Engines, Motors and Turbines, Alfred Morgan

B. Films

1. The Flow Of Electricity, YAF
2. Introduction To Electricity, Coronet
3. Learning About Electric Current, EBF
5. Magnetic Effects Of Electricity, EBF
6. Electromagnets, YAF
7. Electricity, SVE
8. Electricity, YAF
9. The Wonder Of The Electric Light, EGF
10. Making Electricity, EBF
11. Electricity All About Us, Coronet
12. Magnets, Gateway

C. Filmstrips

1. The Wonder Of Electricity, EGF
2. Distributing Electric Power, Popular Science
3. Electricity, EBF
4. Electricity, SVE
5. Electricity, Visual Sciences
6. Electricity, YAF
7. Electricity At Home, Scribner

LESSON TWENTY-SIX

I. CONCEPT:

A. Visible and invisible light are forms of radiant energy.

B. The eye is an organ which receives light, forms images and sends the images to the brain

II. OBJECTIVES:

A. To review the behavior of light

B. To learn what happens to light when it strikes an object

C. To learn the function of various parts of the eye

D. To learn some of the invisible types of radiant energy

E. To develop an awareness of the importance of invisible types of radiant energy

III. PROBLEM:

To create an understanding of the visible and invisible types of radiant energy

IV. MORE FUN

A. Books

1. Communication: From Cave Writing To Television, Julie F. Batchelor
2. Behind The Scenes In Television, David C. Cooke
3. All About Radio And Television, Jack Gould
4. Lens Magic, Frances Rogers
5. The Wonder Of Light, Hy Ruchlis
6. The First Book Of Television, Edward Stoddard
7. Prisms And Lenses, Jerome S. Meyer
8. The Adventur Of Light, Frank Jupo
9. Light, Bertha M. Parker
10. Television Works Like This, Jeanne Bendick
11. Let's Go To A Television Station, Naomi Buchheimer

B. Films

1. Behavior Of Light, EBF
2. Light, EBF
3. Light, YAF
4. How Motion Pictures Move And Talk, United World Films
5. How Television Works, United World Films
6. Learning About Light, EBF
7. Light All About Us, Coronet
8. Light All About Us, EBF
9. Light And Shadow, YAF
10. The Nature Of Color, Coronet
11. Television: How It Works, Coronet
12. Television Serves Its Community, FA
13. You And Your Eyes, Walt Disney

C. Filmstrips

1. How Television Works, Popular Science
2. Television Series, 3 filmstrips, Filmscope, Inc.
3. You And Your Eyes, EBF
4. Your Body's Message System, Curr F
5. The Camera, Harmon Foundation
6. The Eye And The Camera, Popular Science
7. Light, EBF
8. Light, Visual Sciences
9. Light, YAF
10. Light And Color, YAF

LESSON TWENTY-SEVEN

I. CONCEPT:

Sound is one form of energy.

II. OBJECTIVES:

A. Review characteristics of sound waves

B. To cause an understanding of the transmission of sound

C. To understand the vibrations that make possible communication with one another

D. To learn the mechanism of the ear that enables it to receive sound waves

E. To learn of the impulses caused by the sound waves when they reach the ear

F. To learn the function of the brain in interpreting sound waves

III. PROBLEM:

To create an understanding of the many mechanisms necessary for the ear to receive a sound wave

IV. MORE FUN

A. Books

1. Messages, Men, And Miles, Robert Wells
2. Sending The Word, Walter Buehr
3. Sound: An Experiment Book, Marian E. Baer
4. Timmy And The Tin-Can Telephone, Franklyn M. Branley
5. Drums, Rattles And Bells, Larry Kettlekamp
6. Sounds All Around, Tillie Pine and Joseph Levine
7. The True Book Of Sounds We Hear, Illa Podendorf
8. Now I Know, Julius Schwartz
9. Mr. Bell Invents The Telephone, Katherine B. Shippen

10. Oliver Sounds Off, Jack Bechdolt
11. All About Sound And Ultrasonics, Ira M. Freeman
12. Make Your Own Musical Instruments, Muriel Mandell and Robert E. Wood
13. Sounds All Around, Tillie I. Pine and Joseph Levine
14. Your Telephone And How It Works, Herman and Nina Schneider
15. Voice Across The Sea, Arthur C. Clark
16. Boys' Second Book Of Radio And Electronics, Alfred P. Morgan

B. Films:
1. Learning About Sound, EBF
2. The Cause And Nature Of Sound, Jam Handy Organization
3. How Sound Travels, Jam Handy Organization
4. Sounds Around Us, Eyegate
5. Communication: Story Of Its Development, Coronet
6. Communication In The Modern World, Coronet
7. Learning About Sound, EBF
8. What Is Sound?, YAF
9. Sounds All About Us, Coronet
10. You And Your Ears, Walt Disney
11. Sound Recording And Reproduction, EBF
12. Development Of Communication, EBF

C. Filmstrips
1. Exploring Sound, Popular Science
2. Radio, YAF
3. Sound, EBF
4. Sound, Visual Science
5. Wonder Of The Phonograph, EGF
6. Wonder Of The Telephone, EGF

LESSON TWENTY-EIGHT

I. CONCEPT:

Machines are able to change energy from one form to another.

II. OBJECTIVES:

A. To review the simple machines

B. To investigate the advantages of a wheel and axle and a pulley

C. To investigate the use of a block and tackle

D. To be aware of the complexity of compound machines

E. To learn how machines are able to make our work easier

III. PROBLEM:

To create a clearer understanding of the uses of simple machines and how they make work easier

IV. MORE FUN:

A. Books

1. Machines That Built America, Roger Burlingame
2. Your World In Motion, George Barrow
3. What Makes Wheels Go Round, Edward G. Huey
4. Machines, Bertha M. Parker
5. How Things Work, Peet M. Creighton
6. What's Inside Of Engines?, Herbert S. Zim
7. Tools In Your Life, Irving Adler
8. Doing Work, Glenn O. Blough
9. A Man And His Tools, William A. Burns
10. Machines At Work, Mary Elting
11. Animals, Lucy Sprague Mitchell, Margaret Wise Brown, Blanche Kent Verbeck

12. Plants And Machines, D.C. Heath
13. Everyday Machines And How They Work, Herman Schneider
14. Now Try This, Herman and Nina Schneider
15. About Wonderful Wheels, Frennie Ziner
16. Simple Machines And How They Work, Elizabeth Sharp
17. Mechanical Man, Beril Becher
18. All About The Atom, Ira M. Freeman
19. Atoms Today And Tomorrow, Margaret O. Hyde
20. More Power To You, Herman and Nina Schneider
21. Wings In Your Future, Leo Schneider and Maurice Wings
22. Issac Newton, Beulah Tannebaum and Myra Stillman
23. Machines, Jerome S. Meyer
24. What Makes It Go, Rose Wyler and Gerald Ames
25. What's Inside Of Engines?, Herbert S. Zim

B. Films
1. What's So Important About The Wheel?, Journal Films
2. Machines That Help Farmers, FA
3. Simple Machines: Pulleys, Coronet
4. Simple Machines: Wheels And Axels, Coronet
5. Engines And How They Work, Coronet
6. Evolution Of Power, AV-ED productions
7. Rockets: How They Work, EBF

C. Filmstrips
1. Airplanes; How They Work, Coronet
2. Flying With Jets And Rockets, McGraw-Hill
3. Getting Power From Engines, McGraw-Hill
4. Man Discovers The Atom, EBF
5. Our Friend, The Atom, EBF
6. Simple Machines, FH
7. Simple Machines, SVE
8. Simple Machines Help Us Work, JH
9. Wheels And Axels, JH

LESSON TWENTY-NINE
(Interrelated)

I. CONCEPTS:

A. A plant is a part of a community

B. Animals are found in different plant communities.

C. Man has an effect on the natural balance of plant and animal life.

II. OBJECTIVES:

A. To present the idea of a changing and interdependent forest community as represented along the Natchez Trace Parkway.

B. To establish the concept of a changing and developing forest community.

C. To establish the concept of the interdependence of plants, animals, and man.

III. PROBLEM

A. What makes up a plant community?

B. Why do plant communities change?

C. What kind of environments do different animals require?

D. What have been man's uses and misuses of the land?

E. How has man's thinking about the land and its uses changed?

IV. MORE FUN

A. Books
1. The Wonders Of Life On Earth, Editors of Life and Lincoln
2. Doubleday Pictorial Library of Nature, Doubleday and Co.
3. Plant Ecology, W. B. McDougall
4. Mississippi, A History, John K. Bettersworth

B. Filmstrips
1. Historic Natchez-Vicsburg Area, MFI
2. Travel In Mississippi, MFI
3. Development of Natural Resources In Mississippi, MFI
4. Tourest Attraction In Mississippi, MFI
5. A Trip Through The Capital City, MFI

LESSON THIRTY
(Interrelated)

I. CONCEPT:

Evaluation is necessary to learn of the progress made during the year.

II. OBJECTIVES:

A. To choose the best phases of the year's work

B. To choose the best method of presentation of the facts for future use

C. To plan to use the best of all the work to be incorporated in another year's program

III. PROBLEM:

To learn the best of the lessons during the year

BOOKS FOR TEACHERS

Asimov, Isaac, The New Intelligent Man's Guide to Science, New York: Basic Books, Inc.

Blough, Glenn O. and Julius Schwartz, Elementary School Science and How To Teach It, New York: Holt, Rinehart and Winston, 1964.

Blough, Glenn O. and Albert Huggett, Elementary School Science and How To Teach It, New York: The Dryden Press.

Blough, Glenn O., Julius Schwartz, and Albert J. Huggett, Elementary School Science and How To Teach It (Revised Edition), New York: Holt, Rinehart and Winston.

Carin, Arthur, and Robert Sund, Teaching Science Through Discovery, Columbus, Ohio: Charles E. Merrill Books, Inc.

Craig, Gerald S., Science for the Elementary School Teacher, Boston: Ginn and Company, 1958.

Croxton, W. C., Science in the Elementary School, New York: McGraw-Hill Co., Inc.

Hone, Joseph and Victor, Teaching Elementary Science: A Source-book for Elementary Science, New York: Harcourt, Brace and World, Inc.

Navarra, John Gabriel and Joseph Zafforoni, Science Today for the Elementary School Teacher, New York: Harper & Row, 1963.

Tannebaum, Harold E., Nathan Stillman, and Albert Piltz, Science Education for Elementary School Teachers, Boston: Allyn and Bacon, Inc.

Victor, Edward, Science for the Elementary School, New York: Macmillan, 1965.

SUPPLEMENTARY MATERIALS

Aids for Health Teaching -
Health and Welfare Division
Metropolitan Life Insurance Company
1 Madison Avenue
New York, New York 10010

Algea in Water Supplies -
U. S. Public Health Series Service Publication No. 657
U. S. Printing Office
Washingtnn D. C. 20402 price $1.00

"Inside the Atom" -
Educational Relations Department
M W H General Electric Co.
Schenectady 5, New York

Periodic Chart of the Elementa -
Merck and Company
Rakway, New Jersey

Secure a card from the Bureau of Pharmaceutical Services telling how the public should deal with poison cases.
Bureau of Pharmaceutical Services
School of Pharmacy
University of Mississippi

Free classroom game, "Ring the Bell" -
Breakfast Game
Kellogg Company
Home Economics Services
Department 19-65
Battle Creek, Michigan 49016

"Working with Science" -
Department of Education
Jackson, Mississippi

List of Approved Materials for Elementary Science -
Department of Education
Jackson, Mississippi

"Let's Collect Rocks" -
"Let's Collect Shells" -
Shell Oil Company
P. O. Box 60193
New Orleans, Louisiana 70160

FILM AND FILMSTRIP COMPANIES

AIF	Almanac Films, Inc. 519 Fifth Avenue New York 18, New York
Barr	Arthur Barr Productions 6211 Arroyo Glen Los Angeles 42, California
CW	Churchill-Wexler Film Productions 801 North Seward St. Los Angeles 38, California
Cor	Coronet Films Coronet Building Chicago 1, Illinois
Birad	Birad Corporation 35 West 53rd St. New York 19, New York
EBF	Encyclopaedia Britannica Films 1150 Willmette Ave. Willmette, Illinois
IF	Instructional Films, Inc. 1150 Willmette Ave. Willmette, Illinois
Pictorial	Pictorial Films, Inc. 1501 Broadway New York 19, New York
Sterling	Sterling Films, Inc. 6 East 39th St. New York, New York

YAF	Young America Films, Inc. 19 East 41st St. New York 17, New York
Curr F	Curriculum Films American Educational Projections Corporation 1319 Vine St. Philadelphia, Penn.
EGF	Eye Gate House, Inc. 2716 41st St. Long Island City 1, New York
FH	The Filmstrip House 347 Madison Ave. New York 17, New York
CS	Charles Scribner's Sons Educational Dept. 597 Fifth Ave. New York 17, New York
KB	Knowledge Builders Visual Education Center Building Floral Park, New York
JH	Jam Handy Organization 2821 East Grand Boulevard Detroit 11, Michigan
PDP	Pat Dowling Pictures 1056 South Robertson Boulevard Los Angeles 35, California
SVE	Society for Visual Education, Inc. 1345 West Diversey Parkway Chicago 14, Illinois
UW-Educ	Educational Film Department United World Films, Inc. 1445 Park Ave. New York 29, New York

Cyanamid	American Cyanamid Co. Lederle Laboratories Division Pearl River, New York
Bailey	Bailey Films, Inc. 6509 De Longpre Ave. Hollywood 28, California
Bray	The Bray Studios, Inc. 729 Seventh Ave. New York 19, New York
FAC	Film Associates of California 10521 Santa Monica Boulevard Los Angeles, California 90025
Cenco	Cenco Educational Films 1700 Irving Park Road Chicago, Illinois 60613
PS	Popular Science Publishing Co. Audio-Visual Division 353 Fourth Ave. New York 10, New York
NAS	National Audubon Society 1130 Fifth Ave. New York 28, New York
IBF	International Film Bureau 57 East Jackson Boulevard Chicago 4, Illinois
NET	National Educational Television Film Service Indiana University Bloomington, Indiana
Moody	Moody Institute of Science 11428 Santa Monica Boulevard Los Angeles 25, California

TFC	Teaching Film Custodians, Inc. 25 West 43rd St. New York 36, New York
WLF	Wild Life Films 5149-5151 Strolm Ave. North Hollywood, California
MFI	Mississippi Filmstrip, Inc. Box 165 Natchez, Mississippi
VS	Visual Sciences Box 599-HW Suffern, New York
Photo Lab	Photo Laboratory, Inc. 3825 Georgia Ave., N.W. Washington, D. C.

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Steck-Vaughn Science Series, Austin, Texas, 1961.

Tannenbaum, Harold E., Science Education for Elementary School Teacher, Boston: Allyn and Bacon, Inc., 1965.

Thurber, Walter A., Exploring Science, Atlanta: Allyn and Bacon, Inc., 1964.

Van Atta, Frieda E. V., How To Help Your Child In Grade School Science, New York: Random House, 1962.

Visner, Harold, Simple Science Experiments, Palisades, New Jersey: Franklin Publishing Company, Inc., 1960.

Webb, James E., What's Up There?, Washington: U. S. Government Printing Office, 1964.