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ABSTRACT

GRADES OR AGES: No mention. Appears to be upper elementary. SUBJECT MATTER: Science units--plants and animals. ORGANIZATION AND PHYSICAL APPEARANCE: The guide is divided into 35 activities. It is mimeographed and staple-bound with a paper cover. OBJECTIVES AND ACTIVITIES: No objectives are mentioned. The activities suggested aim to recreate common types of natural environments through the use of aquariums, vivariums, ant colonies, small gardens, etc. so that children may observe various plants and animals and study some of nature's ways of adaptation. INSTRUCTIONAL MATERIALS: Materials needed for an activity are listed with the activity description. The guide also contains a short bibliography. STUDENT ASSESSMENT: No mention. (RT)

September, 1970

SCIENCE EXPERIENCE UNIT:

PLANT AND ANIMAL ADAPTATIONS

Ferguson-Florissant School District
St. Louis, County, Missouri 63135

INTRODUCTION

These Science Units provide a framework around which to set up experiences appropriate to the students in the classroom. The units build upon a child's natural curiosity and actively involve him in making discoveries and solving problems.

In the primary levels of science, the learning emphasis is on using the powers of observation, measuring, classifying, using numbers, and communicating. Skills used in process science are basic tools of learning and can best be developed through direct experience.

Pupil involvement is emphasized throughout the units, but many sources of learning materials including current textbooks, reference books, and multi-media are combined to provide a rich program of science learning.

PLANT AND ANIMAL ADAPTATIONS

Living things have the ability to adjust to their environment. An environment can be hot or cold, dry or wet. The ability to adjust is called adaptation. The plants and animals that adapt to changing conditions are the ones that survive.

Changes in the environment are occurring constantly. Some changes are so slow they go unnoticed. Others, such as forest fires, and earthquakes, take place quickly and with violence.

The activities suggested in this unit allow the children to recreate common types of natural environments for observing various plants and animals and to study some of nature's ways of adaptation. Through observation, the children become aware of the characteristics of living things. By creating these simulated habitats, they develop an understanding of the basic needs of living things and the nature of compatible relationships between the living things and their habitats.

ACTIVITIES

PREPARING AN AQUARIUM

In establishing an aquarium, the student is led to assemble equipment and to make a finished aquarium. Even if the classroom has stocked a commercial tank, the pickle jar aquarium is desirable. The child will now have become involved in a sustained science project.

At the end of this set of activities, the student will be able to:

a. Assemble an aquarium.

b. Demonstrate the effects of sunlight upon an aquarium.

c. Communicate measurement in terms of degrees of fahrenheit.

d. Demonstrate a method of evaporation.

e. Describe varieties of shells.

f. Tell how animals grow and change.

g. Name typical plants and animals that live together.

h. Record changes.

1. Make an Aquarium

Materials: gallon pickle jars
coarse sand
3 lb. coffee cans in which to wash the sand
large wooden mixing spoons

Procedure: Have children wash the jars well. Rinse well, leaving no trace of soap or detergent. Fill the coffee cans about one-third full of sand. Wash and stir with spoon, pouring off the dirty water. Do this at least six times or until the water is clear. Put two inches of sand in each gallon jar. Pour water into the jar until water level reaches two inches from the mouth of the jar. Let stand for several days.

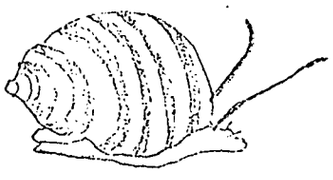
2. Plants for the Aquarium

Ask children to bring any water plants they can spare from their aquariums at home. Plant some in each aquarium.

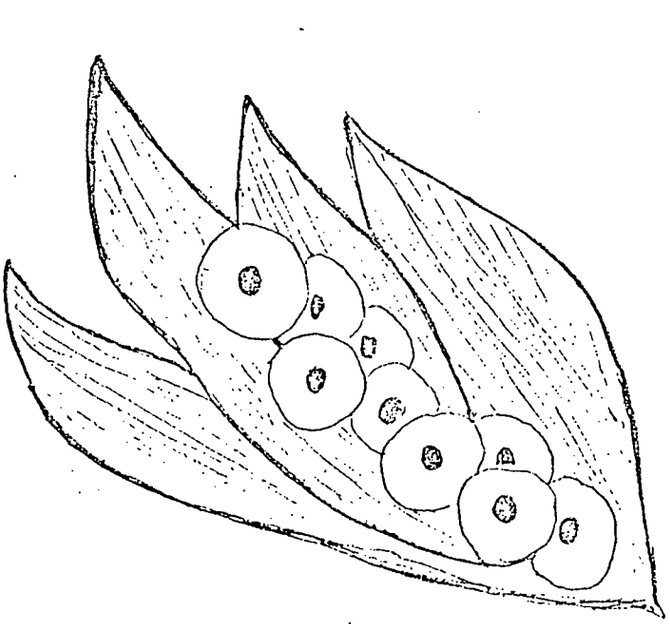
When supplying aquariums yourself, use one bunch of anarchis (about 20¢) and break into three or four inch stems. In a guppy aquarium, the plants seldom get uprooted and often grow and multiply under good conditions. When supplying with eelgrass, cabomba, and ludwigia, vary the appearance of the aquarium. The children push the stems or roots into the sand.

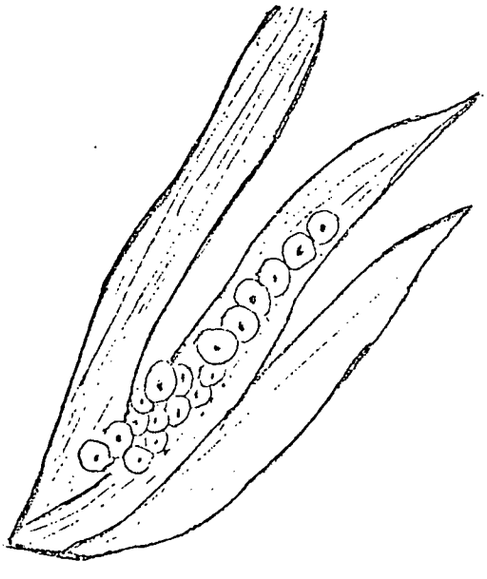
3. The Snails

First Day: Have the children bring in any snails from available aquariums. Anyone who has guppies will supply you with snails. They grow well in guppy tanks.



Use the hand lens and have the children describe each snail. Ask: Do your snails have color? What color is each one? What color are the feelers or antenna? What color is its head? How does the snail move? When you drop the snail into the water, how does it move through the water? Does it swim? How does it move through the water when it goes from the bottom to the side?





LOOK AT SNAIL EGGS

How does it go up the side? Allow time to watch.

Second Day: Experiment to see how the snail moves when out of water. Have the children try many surfaces. Though surfaces tried are not teacher oriented, they will probably try the following:

desk top	sand
glass	gravel
a can	a leaf
paper	a finger
wood	a small puddle on the desk
plastic	

At the conclusion of the trial time, discuss what the movements were, if the snail seemed to "enjoy" some places better than others.

Third Day: By the third day, if the snails live, the water is ready for fish.

ACTIVITIES FOR THE AQUARIUM

4. Sunlight for the Aquarium

Does an aquarium need sunlight? Put small aquarium in sunlight for a few days. Discuss what has happened. Ask: What color is the water? What does the sun do to the water?

Use a hand lens. Pour some water into a shallow dish. Look at the water. Tell the children that they see tiny plants called algae. Why did they grow there?

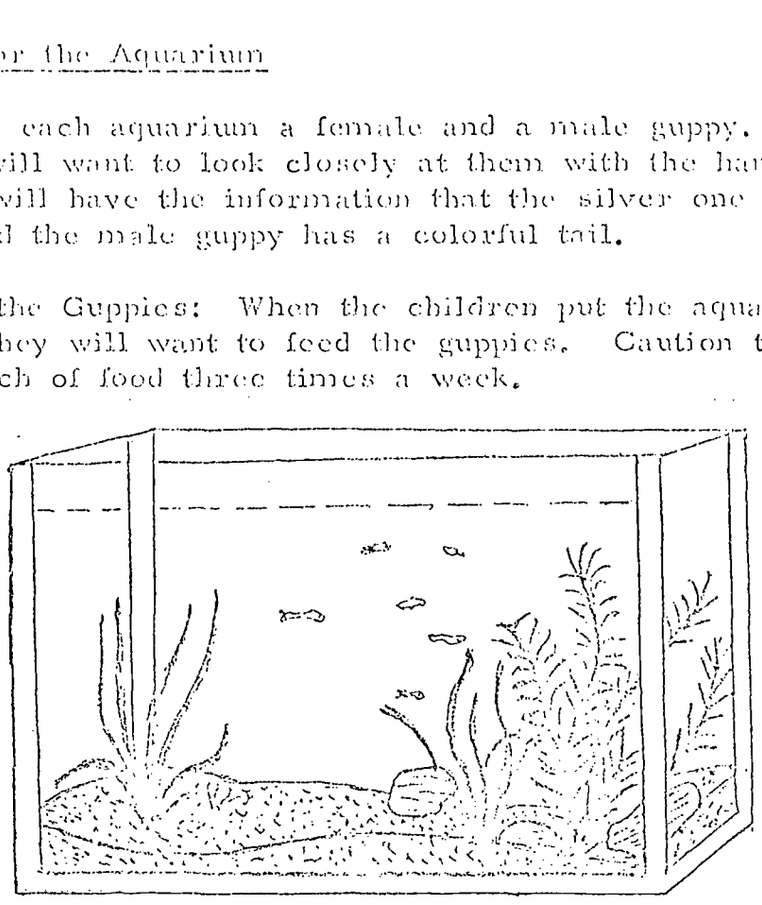
5. Will the Algae Go Away?

Tape dark paper around the aquariums for three days. Leave the aquariums in a dark place. Take the paper off. Discuss with the children the appearance of the aquariums. Is the water green? Are the guppies the same? Do the snails look the same? Do the big water plants look the same as before?

6. Guppies for the Aquarium

Give each aquarium a female and a male guppy. The children will want to look closely at them with the hand lens. Someone will have the information that the silver one is the female and the male guppy has a colorful tail.

Food for the Guppies: When the children put the aquarium back in place they will want to feed the guppies. Caution them to use a tiny pinch of food three times a week.



GUPPY AQUARIUM

7. The Thermometer

Get a variety of thermometers that may be put into water, the type that people keep on the walls or on the desk. Get an aquarium thermometer.

Discussion: What is the temperature in the room? Look at the thermometer, how do you tell what the temperature is? Can you see the numbers? What is the red line? What is the silver line? Do you have a red line or a silver line? What temperature is the water? Is it different from the other temperature? Take the thermometer outside and find out what temperature it is out of doors. What else tells you the temperature?

8. Pond Aquariums

Put the tank in a place that doesn't receive direct sunlight and away from direct heat. Prepare water and gravel as for guppy aquarium or use clear water from a pond or stream. Choose animals such as fishes, insects, crayfish, snails, tadpoles, water

frogs, and salamanders. Catch them from local park ponds, using a juice can, dip net, paper cup, and carry them back in pond water in coffee cans, jars, plastic bags. Don't take animals from fast-flowing streams. Some varieties can be bought in pet shops.

Crayfish

Some animals do not "mix" well. For example, a giant water bug may catch and eat small fish, and some kinds of fish also eat other fish. Be certain that the temperature is the same when mixing or placing in aquarium. Plan an inch of fish to four or five square inches of water surface.

Feed animals once or twice a day. Do not overfeed for the weekend. Just skip the two days. Crayfish and newts can be fed bits of lean ground beef or bologna, prepared fish food, or turtle food. Snails and tadpoles will eat lettuce, spinach, fish food flakes.

Pupils should help plan, set up, and maintain the aquarium. Tanks may be borrowed from pupils. Use sealer on aquarium tanks which have been dry for a long time. Sealer is obtained from pet shops in pint and half-pint cans. Cover the tank top with pegboard or fiberboard or tank covers to prevent excessive evaporation.

When you sit quietly by a pond, you will see, on the surface, bugs, beetles, and other insects moving about. They float because the surface of the water acts as a "skin," preventing them from sinking.

Diving Beetle

Water Boatman

Below the surface, there is a tremendous struggle for survival, because the creatures living there are all predators---and everything in a pond is good eating. Life in a pond is based on plankton, the microscopic animals and plants which float in the water as far down as light can penetrate. Insects, worms, fish, amphibians, reptiles, and birds form links in the food chain of a fresh-water pond.

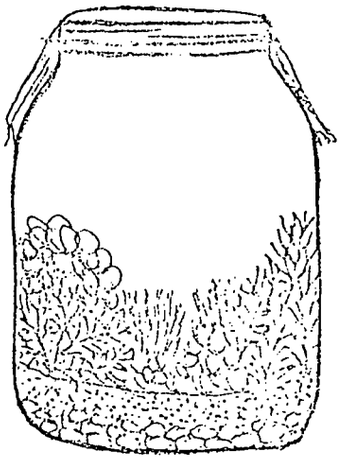
9. Salt Water Aquariums

The aquariums should be well sealed at its metal parts with aquarium sealer. The tank should receive indirect light. Protect the stand with a sheet of plastic. Spread sand or gravel as for any other aquarium. Use aquarium salt and follow directions as given for brine shrimp, or one pound per three gallons of water. Use a clear glass cover. Use an aerating pump and filter. Seahorses are often used to stock this type of tank. Hatch a small fish bowl or cottage cheese carton of brine shrimp. Pour through filter paper before feeding to seahorses. The seahorses cannot swallow the eggshells. Use a thermometer to maintain the temperature around 75-80 degrees fahrenheit.

10. Bog or Swamp Garden or Aquarium

Use equal parts of gravel, peat, and sand to a depth of two inches. Place a pan of water on a gentle slope of earth to make it easy for animals to climb in and out.

These plants are most appropriate for a swamp environment: mosses, ferns, Venus Fly Traps, and pitcher plants. Set the other plants in deeper soil. To make an attractive display, place the taller plants in the back and on the sides. Arrange everything to cover the bare earth. After planting, sprinkle with aquarium water or water from freezer frost, or distilled or rain water.



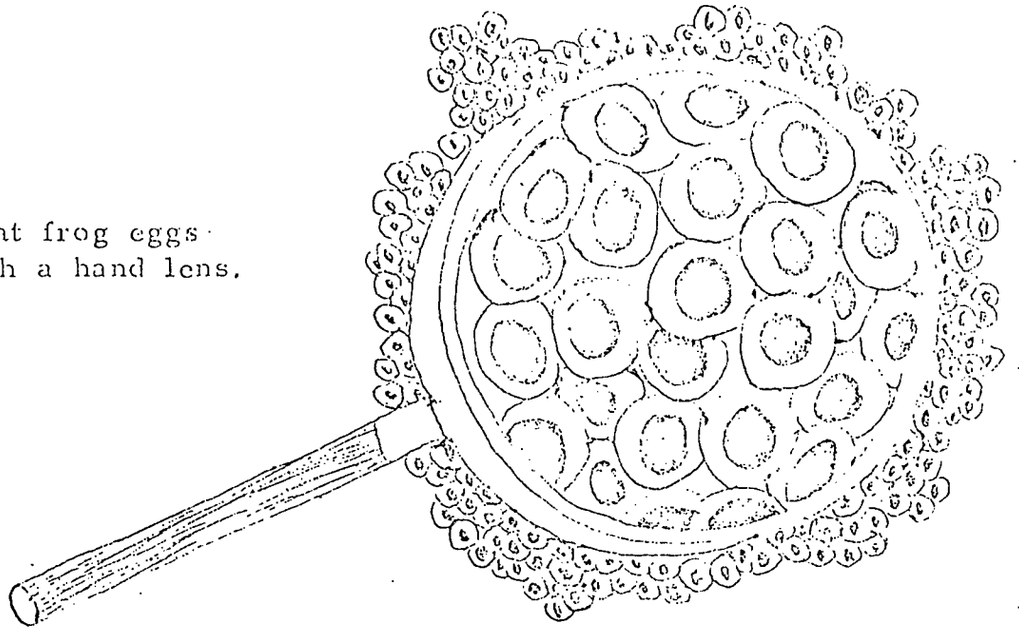
For animals, choose a few small tree toads, newts, salamanders, or very small turtles. Tadpoles will remain in the pan of water. These animals will live in a moist, marshy habitat if limited in number and type. Most of these animals prefer food such as insects, caterpillars, moths, worms, and slugs. Mealworms can sustain them for winter.

Tiger Salamander

11. Take a Walk

Visit a nearby pond or stream. Observe the ways living things adapt to different habitats. Bring back some interesting plants and animals for study in the classroom. (Perhaps children can do this as a weekend project.)

Look at frog eggs through a hand lens.



12. Plants and Animals Need Air

The children will observe and describe in their own words the changes they see. The children can demonstrate that plants and animals need air containing oxygen.

Teacher Information: The candle flame removes most of the oxygen, and the plants continue to grow for a short time. Some of the oxygen is returned to the air by the plant, but not enough to sustain life. The fly or insect dies after a time. Oxygen is needed for both plants and animals.

Materials: Large mouth jar--at least a quart size (Miracle Whip jar), quart pan, water, small yard plant (almost ready to blossom) with dirt around the roots.

Fly or any available insect (no moth, it will fly into the flame), perhaps a lady bug, cricket, spider, a mealworm on a leaf, or a beetle.

Cardboard, a little larger than the jar opening.

Procedure: Put the plant with dirt around the roots into quart pan. Place candle at side of plant but not touching plant or sides of jar.

Keep the fly inside the jar with a perforated lid on the jar. This jar will be used to cover the lighted candle and the plant.

Pour water into the quart pan until it is half full.

Light the candle.

Unscrew the lid from the jar, being careful to keep the insect in the jar. Cover the jar with cardboard and turn upside down (jar and cardboard).

Cover the burning candle and plant with the "upside down jar" that contains a live fly or insect.

Set aside and watch daily for one week.

First Day: Give out the Recording Sheets (see next page) and 9" x 12" unlined paper for picture. Record on the day the experiment is set up.

Discussion: Did the insect move or fly in the jar? Is the plant living? How do you know it is living? Is the insect living? What is the candle doing? What can we record for the plant today, i.e., it is living, it is growing. Draw a picture of the experiment.

Second Day through Fifth Day: As the children discuss observations, ask: How does the insect look today? Is the plant still living?

Fifth Day: Discuss what happened to the insect. Which lived longer, the plant or the insect? What is needed for most plants and animals to live and grow? How can we show that oxygen is needed for plants and animals to grow?

Conclusions: Make some sentences that tell what plants and animals need to grow and to live. Put these sentences on the back of the Record Sheet.

13. The Variety of Living Things is Endless

There are one and a half million species of living things. All living things have common characteristics: they all do certain things such as move; take in food, water, and oxygen; grow; and reproduce.

Record Sheet

PLANTS AND ANIMALS NEED AIR

Name_____

	PLANT	ANIMAL
First Day		
Second Day		
Third Day		
Fourth Day		
Fifth Day		

All living things need oxygen and water to keep alive.

All living things are made of cells. Living things are classified on the basis of structure in two large groups--plants and animals; these are divided into smaller groups; these, in turn, are divided into still smaller groups, and so on, down to individual species. (The set of living things has two subsets--plants and animals.)

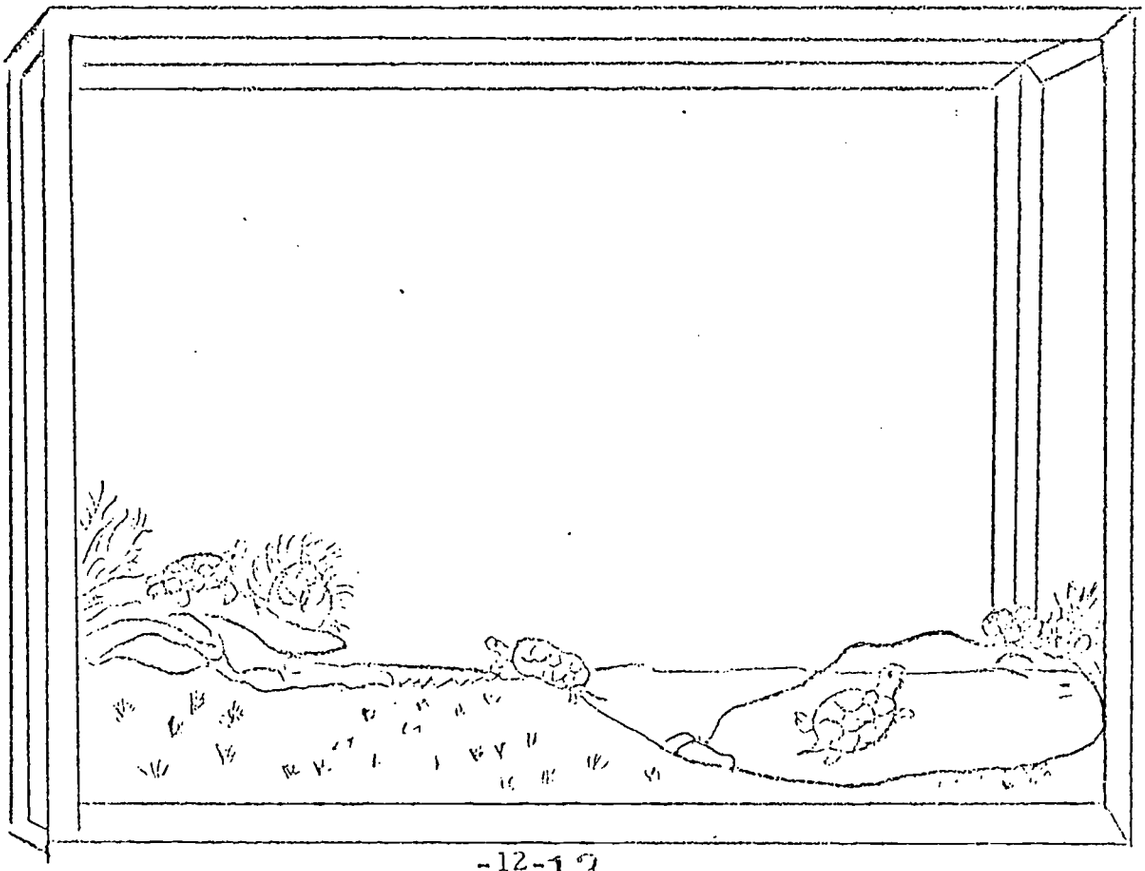
All animals have common characteristics: animals move from place to place through their own efforts, plants generally do not. Animals take food into their bodies as pieces of material; plants generally do not.

Life continues although every living thing dies.

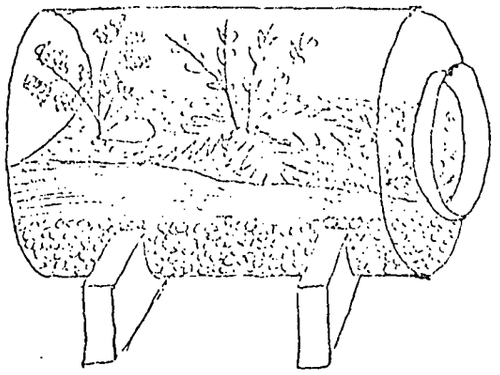
14. Vivarium

The students will be able to name basic needs of plants and animals which must be satisfied in their habitats. Through observation, they will identify the characteristics of living things and identify compatible relationships between living things and their environments indoors and outdoors.

A vivarium is an enclosure for keeping or raising and observing animals or plants indoors.

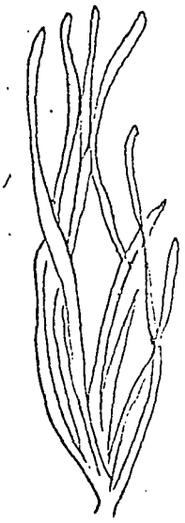


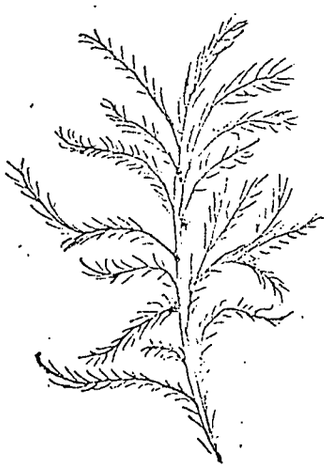
Terrarium: A vivarium without standing water.



Aquarium: Container or artificial pond for keeping aquatic plants and animals

Water Plants which are commonly sold in pet shops for aquaria include arrowhead, anarchis, sagittaria, vallisneria (corkscrew or eelgrass). Duck weed is an undesirable plant, as each little clover-like cluster tends to choke the aquarium.





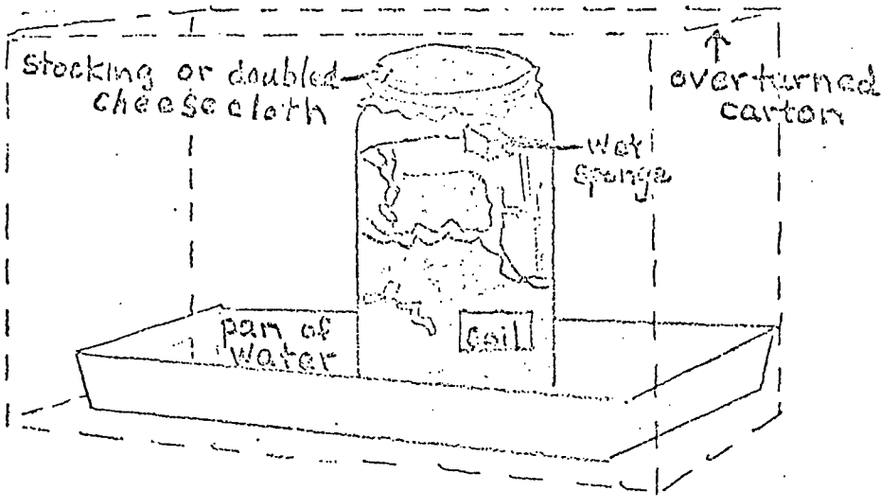
15. Raising Earthworms is Easy

Have children bring several earthworms to class. Place layers of dirt, sand, decayed vegetation and corn meal in a jar or aquarium. Observe the earthworms. They will extract digestible food and excrete the rest. The children will be able to observe the tunnels in the soil as the earthworms eat their way around.

Discuss with the children, the economic importance of earthworms to man.

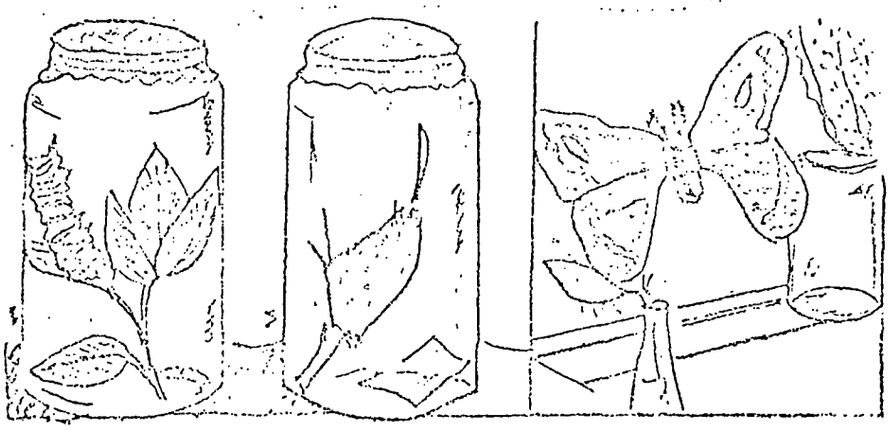
16. Ant Colony

It is easy to stock an ant colony. A simple, adequate ant nest can be made using a large jar. Fill the jar with loose, damp soil taken from an ant nest. A damp sponge placed on top of the soil will keep it moist.

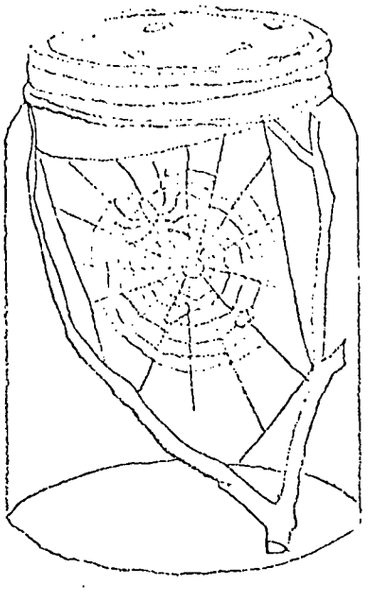


Capture adult ants and pupae for the observation nest. A Mason jar cover with a round piece of wire screen instead of the sealing lid will provide air and can easily be put on and taken off for feeding.. Except when children are looking at the ant tunnels, the jar should be kept covered with a dark cloth or paper. Otherwise, the ants will avoid the glass sides when building their tunnels.

Other small animal and insect cages, such as mice cages, spider cages, and cocoons are equally easy to construct and maintain. The students will be able, then, to observe the habits of these various animals and study their behavior patterns.

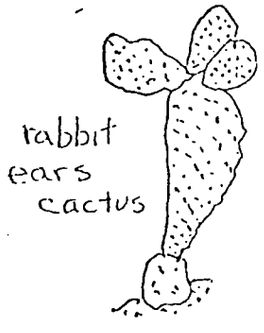


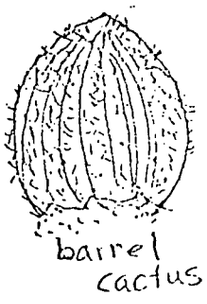
Animal and Insect Cages (continued)



17. Cactus Garden

It will be beneficial and fun to start a cactus garden in your classroom. Once established it requires very little care. Fill the bottom of a terrarium or other container with a sand and soil mixture. (Add a little charcoal to prevent root rot.) Wash the cactus to clean out all the air pores. Water when first transplanted, then only when the surface of the sand is dry. Do not place the plants in direct sunlight for longer than two or three hours daily. The cactus plants do not need extreme heat, but cannot thrive in chilly temperatures. Here are a few interesting species to include: rabbit ears, old-man, prickly pear, barrel, and thimble cactus. Succulent plants such as hen-and-chickens will do well in your cactus garden.





18. Fern Garden

A variety of interesting ferns may be grown in the classroom, such as the Boston fern, holly, maidenhair, pteris, and asparagus fern. They grow in wooded areas or shady places near streams. Carefully dig up the rhizome or underground stem. Most ferns expose only their leaves above the surface of the soil. Transfer the fern to a larger pot or terrarium. The soil should be a mixture of peat moss, good soil, and sand. Ferns require medium light and should be watered from the bottom. Do not let the soil dry out.

Ferns reproduce by alternation of generations--the sporophyte plant (described above), the gametophyte, or sexual plant, may be grown from it. Place a leaflet which has brown spots (sori) on a piece of paper. The spores will drop off. Prepare a pot for planting with gravel on the bottom, then soil, and one half inch of sand on top. Pour boiling water over this in order to sterlize the contents and flower pot. The young gametophyte is very susceptible to bacterial damage. Sprinkle the spores on top of the wet sand. Cover the pot with a piece of sterlized glass and stand the pot in a saucer of water. In three to four weeks the small, heart-shaped prothallia will appear. Thin them out to prevent crowding. In two to six months, small ferns will grow. When they are developed sufficiently, transplant them in containers discussed previously.

19. Growing Algae

Growing algae is a simple classroom activity and will help children understand the structure and function of these simple green plants, the conditions under which they thrive, and their value as food for aquatic life. As man exhausts the land area for food production, he will have to turn to water areas for future supplies. Therefore, children should become acquainted with the lower plants to appreciate their potential economic value.

Algae may be found in ponds, streams, lakes, on moist rocks, and on trees. The common species will include spirogyra, euglena, oscillatoria Ulothrix, vaucheria, and proctococcus. Collect the samples in a jar, including the water in which you found the algae. Transfer them to a classroom aquarium (allow the tap water in the aquarium to stand for a day to allow the chemicals in it to dissipate). If you put too many specimens in one container, you will cause water mold to form.

20. Fruit Flies

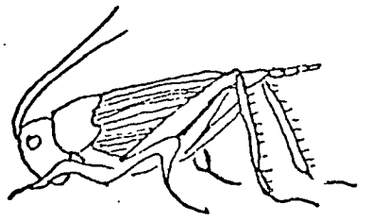
Put some fruit in a jar. Put a paper funnel into the jar--the fruit flies will fly into it. Take the funnel away and close the jar with cheesecloth. Keep a magnifying lens close by so children can observe. Soon there will be eggs in the jar. Little wormlike things will come from the eggs. Soon there will be more fruitflies. If you have watched the jar closely, you will be able to tell where they came from. (See next page)

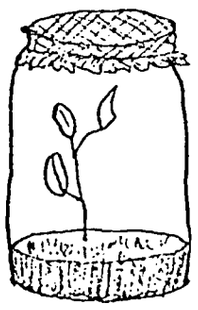
21. Cricket Cage

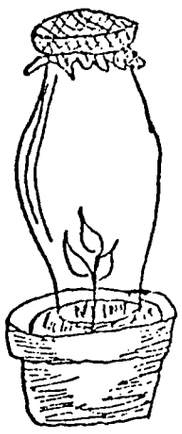
Keeping crickets is very easy. First make a cricket cage from a jar with some dirt in the bottom with a root of fresh grass or clover. Be sure to put some screen or mosquito netting over the top so your cricket does not escape. Water the grass to provide food and cover for your cricket.

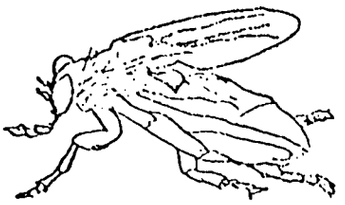
If you want to observe your cricket eating, give it a small piece of sweet apple or melon rind. Crickets are very fond of pulpy fruits. Be sure to remove any uneaten portions of food so the cricket cage does not become dirty and foul.

Only the male crickets chirp, so you may need two or three to insure cricket song. He rubs his wing covers back and forth to develop his song.

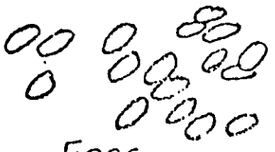








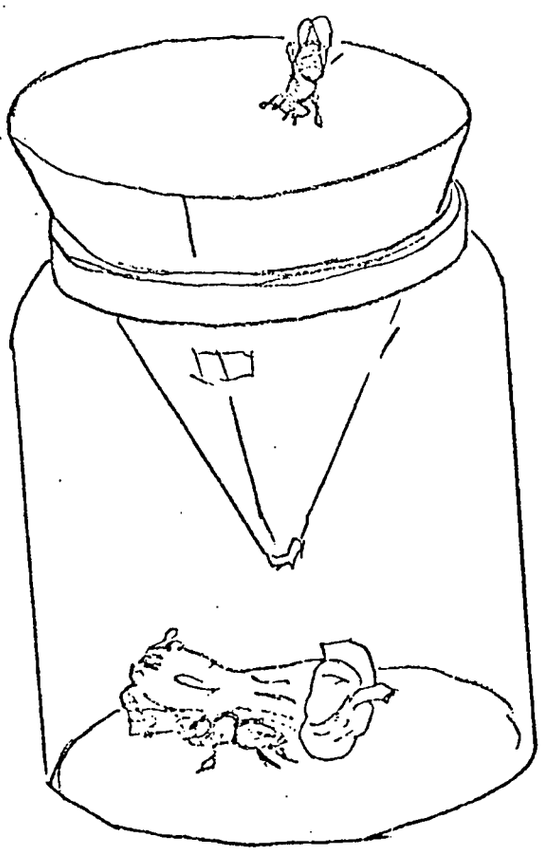
Female Fruit Fly

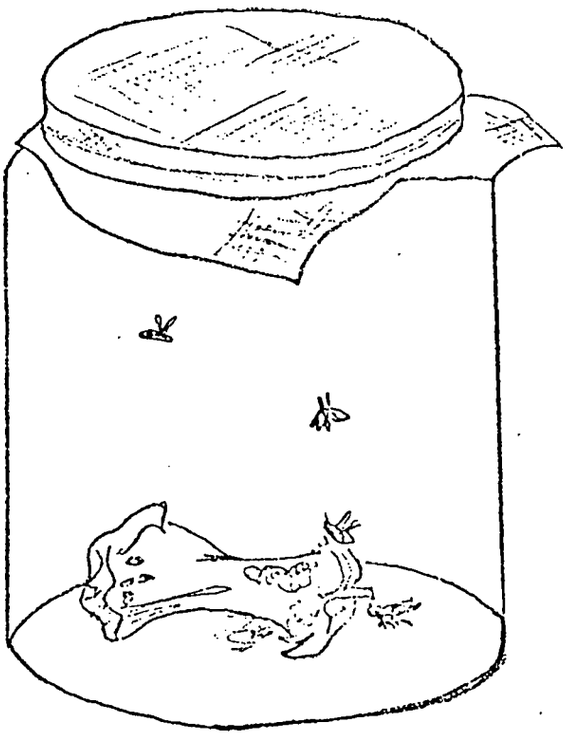


Eggs

Larvae

Pupae





BIRDS

The migration of birds is one of the oldest of nature's mysteries. Since birds that are less than a year old and have never migrated without accompanying older birds, scientists feel that migration is instinctive.

The gradual decrease of the length of the days in fall, rather than a decrease in temperature, or lack of food, seems to be the stimulus that brings on migration. The practical result of migration, however, is that the bird reaches a warm place where food is abundant.

In their migration, birds follow definite paths, or flyways, year after year. Just how the birds manage to find their way has been the subject of much speculation. Experiments indicate that some birds use the stars to guide them. There is also the theory that birds are somehow guided by the magnetic field of the earth.

Many migrating birds store extra food in their bodies before migration, just as animals fatten before hibernation.

There are four great migration routes in North America--the Atlantic, Mississippi, Central, and Pacific routes.

The food habits of birds vary widely. Some eat only seeds (junco, sparrow, cardinal) while others live only on insects and worms (woodpecker, and warbler), while still others eat small mammals and birds of different species (hawk, owl).

At the end of this set of activities, the student will be able to:

a. Identify several kinds of birds by sight and song.

b. Construct a simple bird feeder.

c. Explain the reason for migration of birds.

d. Tell how different birds catch their food.

e. Explain why birds have different sized and shaped beaks and feet.

22. Ask children some questions to stimulate an interesting discussion. For example: How do birds know when to fly away? How do they know where to go? When does a robin know that it is time to come back?

    Children should know that fall brings with it conditions which are not favorable for the majority of birds. Develop the idea with the children that fall is a period of transition. Children should be able to see the relationship between the change in the weather and the change in activities.

23. Discuss with them also, the other animals and plants that are affected by a seasonal change.

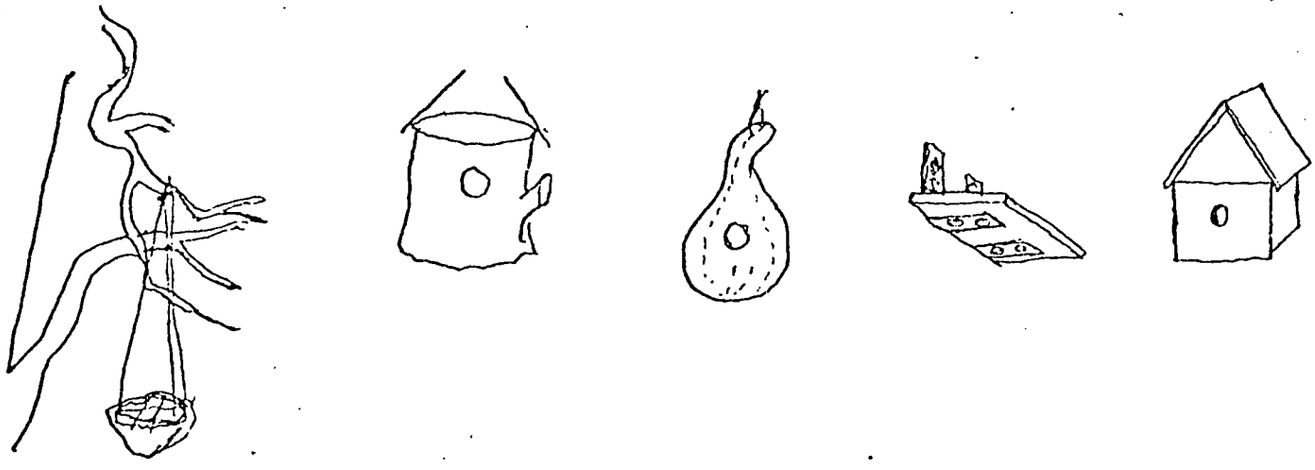
24. Find pictures or obtain film on birds and the foods they eat. The children can then relate the disappearance of food in the fall of the year and the migration of birds.

25. Have the children keep a record of the different birds they find in their community. Be sure they make careful observations, and look for differences among birds. They should note the differences in color, size, beaks, and feet.

26. Find a bird nest and bring it to school. Take the nest apart. Discuss what materials you found in the nest. What kind of bird do you think lived in the nest? Find another nest and compare them. How do they differ from each other?

27. Encourage the children to find pictures of birds and bird feathers.

28. Construct a simple bird feeder. This can be done as a classroom project.



29. Draw a picture of a favorite bird you saw during the summer. Try to get the feet, color, beak, and other characteristics as nearly right as you can.

30. Build a feeding station at your window--when birds start coming to the feeder, if you keep the supply full, the birds will depend upon your "table" and come every day.

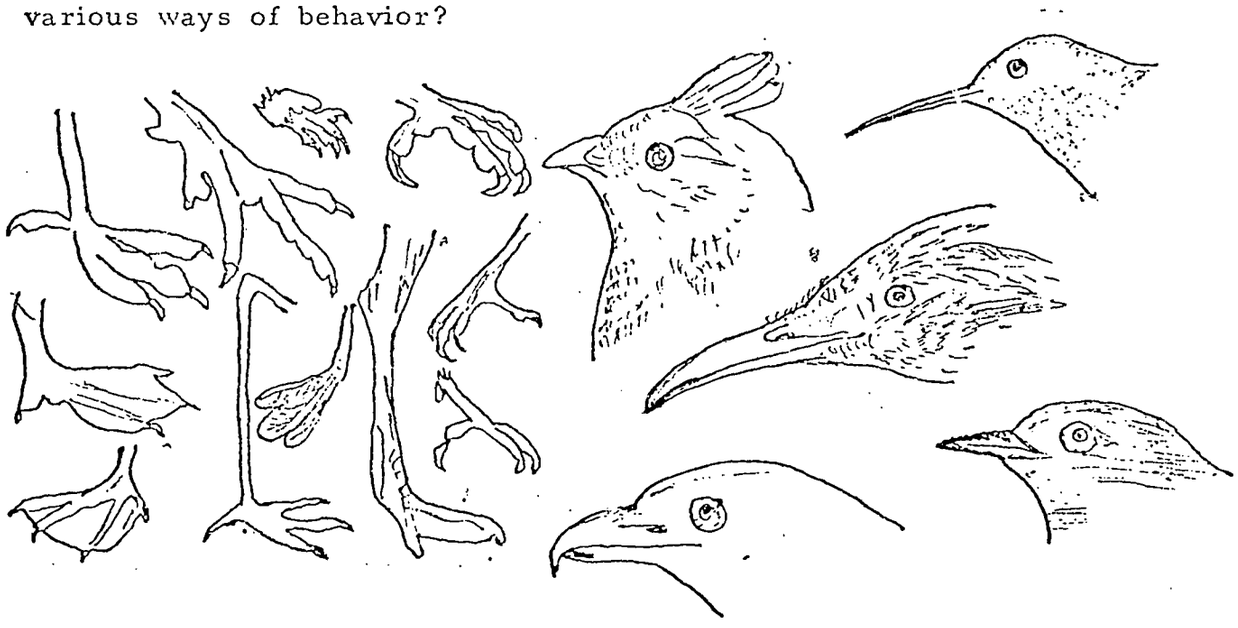
31. Listen to bird songs. Get a recording and see how many birds you can identify by their songs.

32. Reserve an incubator from the area science consultant or have children construct their own and hatch some chickens. Arrangements should be made for giving them to a farmer, for the chicks do get smelly and require a good bit of care.

33. Take a walk to see some birds and notice what they are doing: perching, flying, calling, bathing, drinking, feeding. Look for birds' nests in the trees, but do not disturb nesting birds. The following birds are the ones most likely to be found in the city: pigeon, starling, sparrow, robin, grackle, blue jay, cardinal. Children at this level need not identify all of them.

34. In the spring, children may put out peices of string and knitting wool in a park, lawn, or playground for birds to use in building nests. They may see that some birds take this material; others do not.

35. Ask the children to notice the different types of beaks and feet that birds have. How have birds adapted themselves for their various ways of behavior?



EVALUATION

Childhood random experiences with plants and animals enable children to perform gross observation and identification. A natural outgrowth of the observation of living things is the knowledge that living things engage in certain activities in order to stay alive. Study of the relationships of living things to each other and to their environments develop concepts of the interdependence and the adaptation of living things.

A young child's natural inquisitiveness about living things can be used as a springboard to motivate him to develop some thoughts about living, growing, and dying.

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