DOCUMENT RESUME

ED 097 210 SE 018 216

TITLE	Environmental Activities. Environmental Education Curriculum.
INSTITUTION	Topeka Public Schools, Kans.
SPONS AGENCY	Bureau of Elementary and Secondary Education (DHEW/OE), Washington, D.C.
PUB DATE	May 74
NOTE	106p.; Best copy available; Occasional marginal legibility
EDRS PRICE	MF-$0.75 HC-$5.40 PLUS POSTAGE
DESCRIPTORS	Animal Behavior; Biological Sciences; *Curriculum Guides; *Early Childhood Education; *Elementary School Science; *Environmental Education; Instruction; Instructional Materials; Learning Activities; Natural Resources; *Outdoor Education; Primary Education
IDENTIFIERS	Elementary Secondary Education Act Title III; ESEA Title III

ABSTRACT

This unit attempts to respond to societal concerns for the rapid depletion of our world's natural resources, our increasing world population, current pollution problems and the lack of knowledge about natural interdependence. The material is intended as a source from which primary teachers can select activities from five generalized groups as follows: animals; plants; weather; miscellaneous environmental activities such as a rock study, how to use a thermometer, making microscopic slides and discovering dirt; and developing observation skills and using all five senses. Each activity is intended as a separate entity with a general format of stating the activity's objectives, listing materials needed, providing background information and describing the activity. (MLB)

environmental education curriculum

ENVIRONMENTAL EDUCATION PROJECT
ESEA TITLE III, SECTION 306

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A unit developed by the Environmental Education Project Staff, May, 1974, for primary-level elementary school students

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ENVIRONMENTAL ACTIVITIES

The work presented or reported herein was performed pursuant to a grant from the United States Office of Education. However, the opinions and material expressed herein do not necessarily reflect the position or policy of the U. S. Office of Education, and no official endorsement by the U. S. Office of Education should be inferred.

ENVIRONMENTAL ACTIVITIES

Foreword

The rapid rate at which we are using our world's natural resources, our increasing world population, the pollution problems associated with today's life styles, and the lack of knowledge about natural interdependence have produced a combined effect some call an environmental crisis. This "crisis" atmosphere has caused a concern among various segments of society. The educational and related institutions have responded by developing and implementing various curricula aimed at increasing knowledge and awareness of various parts of our natural and manmade world.

The material in this unit is intended as a source from which primary teachers can select activities that assist in developing student knowledge and awareness of various aspects of their environment. Each activity is intended as a separate identity and can be combined with other activities or classroom activities at the teacher's descretion. For convenience, the activities have been placed in five generalized groups: (1) Plants, (2) Animals, (3) Observation - Senses, (4) Weather, and (5) Miscellaneous.

This collection of activities has been gathered from several sources and modified. The most frequently used sources were (1) Interlake Environmental and Outdoor Education Title III Program, Chester, South Dakota and (2) U. S. Forest Service, Portland, Oregon.

Glenn Clarkson
Elementary Program Specialist

ACKNOWLEDGMENT

The Environmental Education Project for the Topeka Public and Parochial Schools began operation June 29, 1971. The following individuals deserve recognition for the interest, time, and devotion they gave during the difficult stages of planning and writing and project proposal:

Mr. John Ganger, Coordinator of Curriculum for Special Education
Mr. W. I. Green, Director of Special Education
Dr. Quinton Groves, Director of Health, Physical Education, Safety and Athletics
Mr. Clarence "Tuffy" Kellogg, Assistant Director of Health, Physical Education and Safety
Mr. Stanley Martin, Science Supervisor
Mr. Claude Ritchie, Principal, Gage Elementary School
Mr. William Wagaman, Principal, Avondale East Elementary School
Mr. Lawrence R. Gaston, Director of Federal Programs
Dr. Gilbert Wehmeier, Principal, Curtis Junior High School

The needed support given the project by Dr. Merle R. Bolton, Superintendent of Schools; other members of the central administrative staff; the instruction department; personnel office; business office; data processing department; maintenance department; and Lawrence Gaston, Director of Federal Programs, is gratefully acknowledged.

Special recognition is given to the Board of Education for the Topeka Public Schools, who approved and are supporting this creative, exemplary, and innovative project.

My sincere gratitude is extended to the program specialists for their tireless efforts in developing this elementary unit. Curriculum development and revision has extended the working days for these staff members. My personal thanks are given to Glenn Clarkson, Bob King, and Thad Whiteaker for an outstanding job.

The enclosed curriculum is the result of input from the project's paraprofessionals and volunteers, elementary teachers, Community Council members, parents, students, and interested lay citizens.

With deepest appreciation, I acknowledge the work of the secretarial team. The constant revisions, pressures, deadlines, and demands for quality work were handled in a most outstanding manner by Rita Dreiling, Joyce Hartman, Sue Beattie, Linda Hough, and T. W. Mack.

Donald French
Project Coordinator

TABLE OF CONTENTS

APPENDIX A

Animals

BUGS AND BUG HOMES

OBJECTIVES:

1. To acquaint the student with the concept of animal dependency on its habitat.
2. To acquaint the student with the concept of insects constructing homes, caves, tunnels, and holes to provide them with protection from predators and weather. Some insects modify the environment to better increase their chances for survival much the same as people do.

MATERIALS:

1. plastic bags - one per student
2. various sized glass jars
3. hand spade - 2 or 3 per class
4. jack or paring knife - 2 or 3 per class
5. pieces of old sponge
6. nylon stockings (old)

BACKGROUND:

Many insects construct living quarters in which they are relatively secure from the elements, predation, and disease. Ants, gall insects, wood boring beetles, tent caterpillars, and spiders fall into this category. Examples of these insect homes can usually be found and studied to benefit the students' conception of the interdependency of life. Insect homes or activities can be found in or on just about everything in nature if you observe carefully.

ACTIVITY:

Introduce the activity with questions about insects:

1. What is a bug? How is it different from a bird or animal?
2. What do bugs eat? Do you like bugs?
3. List the different kinds of bugs you can think of.
4. Where do you find bugs?
5. Do insects have homes? List the kinds of homes they have:
   1. cocoons
   2. ant hills
   3. tent caterpillar tents
   4. galls
   5. bee and wasp nests
   6. tunnels in wood
   7. holes in the ground

Suggest to the students that you take a field trip to find different kinds of insects and their homes.

Make a contest out of it. Give rewards to:

1. The one who finds the most insect homes.
2. The one who finds the most unusual insect home.
3. The one who finds the most kinds of insect homes, etc.

Places to look for insect homes:

1. Under rocks, logs, trash.
2. Under bark of dead trees and crevices in live trees.
3. In weed stems and burs.
4. In old buildings and on old building siding.
5. Ant hills can be found almost anywhere.
6. In water, you may find caddis fly larvae that carry their own homes.
7. Tree limbs (Plum and Willow trees often times have tent caterpillar nests.)
8. Inside old cans, fence bracing, etc.
9. Water is home for many insects, particularly during the winter.

Go out and look for insect homes; collect as many as you can to discuss and ovserve in your classroom. Collect only those which are not stinging insects or, if they are, make sure the adult insects are not present. Have the students take field notes on where they find each type of home.

List, on the blackboard, the types of insect homes found:

1. Cocoon
2. Tent caterpillar tent
3. Gall
4. Wasp
5. Mud dobber nest
6. Ant nest, etc.

Have the students study and compare the homes. What kind of insect made the home? How do you know? How big was the insect that made it? Is the insect still inside? How can you tell?

Extract one or two of the insect larvae or adults and study them. Leave some of the insect larvae for later development.

Place the homes in large jars with the lids in place or with pieces of nylon stocking stretched over them. Watch these homes for emergence of adult insects. Be sure to keep a piece of sponge in the bottom of the jar and keep it wet. Record what happens in the jars.

Ask the students questions similar to the following:

Did you find tent caterpillars in water? Why not?
Did you find galls in old buildings? Why not?
What do the insects eat that are living inside the cocoons, galls, or mud nests? How do they stay alive?
Can other insects or birds get in to harm those bugs in their homes?
Make a list of homes according to where they were found. See the attached sample.
Which insects are found in the most places?

SAMPLE DATA SHEET

BUG HOLES

HABITAT TYPES

NAME _____

DATE _____

OLD BUILDING	WOODS	PASTURE (WEED)	SOIL	SLOUGH
mud dobber nest	tent caterpillar	galls	worm holes	cocklebur seed
yellow jacket nest	cocoons	sunflower stems	under rocks	cattail seed head
cocoons	spider webs	spider webs	ant hills	cattail stems
spider webs	willow tree bark	cow pie		
	burdock seeds			

MAN'S PART IN THE PLANT AND ANIMAL COMMUNITY

OBJECTIVE:

1. To determine what man's effect has been on our plant and animal communities.
2. To create an awareness in students about man's responsibilities to our environment.
3. To fortify the concept that every change man makes in the environment affects something else.

BACKGROUND:

The vast great plains area of the United States has acquired a very different face since the time when the buffalo roamed freely throughout the prairies. Most of this change has come about because of man's interaction with nature. Whether this has been a good or bad change depends on each individual's point of view. Large native animal populations (such as buffalo) have been drastically reduced in numbers, but they have been replaced by other species which are now much more abundant. What was once a treeless prairie region now has many small belts of trees dotting it. Each tree belt is a complex ecological community in itself and has introduced new animal and plant populations. Some native communities have been destroyed. The important thing to remember is that man has to make responsible decisions about what we do in the future. We must learn as much about the natural processes which are going on as possible. We must know the effects of the introduction of new species on our environment.

ACTIVITY:

Ask the students the following questions:

1. What has man done to change the face of the prairie?
2. Why has man done things to change the environment?
3. What effect has the change had on your lives?
4. Can man live in harmony with nature and survive?
5. Will he perish if he doesn't?
6. How does man change the environment? Do you change the environment by anything you do?

Take the class out to a variety of plant and animal communities. Examples of some would be alfalfa fields, shelterbelts, pastures, fields, sloughs, parks, streams, ponds, etc. Have the students list the components of each community and man's effect on the community.

Make a list on the board of the various communities and their components. In your study, the shelterbelt may contain the most different species and students may come to the conclusion that the entire prairie should be planted to shelterbelts. However, it should be stressed that all of the communities are important and necessary. We must be sure to include each type of community in our over-all picture of the environment.

Map the communities. Which plants has man introduced? What evidence is present in the community of man's changing it?

Some animals will be found in any or all of the communities. Some will be found in only a few. Plants will also show a definite preference for certain of these communities and won't be present in others. The size of plant and animal community changes with the specific unit you address. The plant community with which man, deer, or fox interacts is much larger than that of a mouse or muskrat.

LET'S MAKE BIRD HOMES

OBJECTIVES:

1. Provide practice in measurement and construction.
2. Introduce the idea that man can benefit wildlife and encourage bird and animal useage of areas where they are not presently found.

MATERIALS:

lumber
tools
nails

BACKGROUND:

Woodland birds which nest in holes are not very abundant. Why? There is a lack of suitable nesting places. How can you change that? Provide nesting boxes.

ACTIVITY:

Ask questions about bird nests and nesting habits. Discuss the nesting habits of robins vs. woodpeckers, wrens vs. doves.

Which nests are most common?
Which do you see the most? Why?
How could you change that?
Do wrens peck holes in wood?
Do blue birds peck holes in wood?
Which birds depend on woodpecker holes in trees?
What kind of trees do woodpeckers need for drilling holes?

Explore and stress the point that birds require special places and conditions to nest. If those places and conditions are not met, then the birds won't nest. Woodpeckers can't drill holes in steel fence posts, and because of this, bluebirds can't nest as well as woodpeckers.

Birds which nest in small cavities in wood, like wrens, chickadees, and bluebirds are not very abundant. They might be if we would provide nesting places for them. The more natural the nesting place looks, the better.

Build a bird house in art or math measurement practice. One house for each child or group. Scrap lumber works the best. You can borrow nails and tools from parents or the custodian. Have students do research to find out what types of houses are suitable for birds in their area.

Take the students out to a park or fence line and hang up one of the birdhouses every 100 feet. You can step off the measurement or use a 100-foot tape. Put some high, some low, some right side up, some hang with entrance toward the ground. Wait a few weeks and return. Have everyone check their nest box and report the findings. Check them again later. There may be nothing in the house, or they might find mice, sparrows, wrens, chickadees, downy woodpeckers, blue birds, or spiders have used their bird house. Record the results of this experiment as follows:

How many boxes were used?
How many sparrows?
How many wrens?
How many mice?

Which locations received the most use? High, low, face down? Small holes, large holes, painted or unpainted?

Do you think you did our wildlife a favor?

Let's go back next fall and see what has happened.

Save your report and information.

Have each child put his name and address inside the lid.

BIRD NESTS AND PLANTS

OBJECTIVES:

1. To introduce the students to birds and bird nests.
2. To help the student discover that birds depend on plants for their nest sites and nest materials.
3. To acquaint the students with reasons why birds select certain places to nest and the different ways which they nest.
4. To acquaint the students with the beauty and delicateness of life.
5. To acquaint the students with the protective instincts and reactions of nesting birds.
6. To acquaint the students with the idea of providing nesting habitat for birds.

MATERIALS:

1. Several binoculars
2. A light step ladder
3. Paper and clipboards for data collecting
4. A few paper bags for collecting empty or abandoned nests

BACKGROUND:

Most birds depend a great deal on plants for nesting materials and sites. Also most birds will nest at fairly characteristic heights and places in trees and brush or on the ground. Why do birds favor one height or type of tree cover over another? No one knows for sure and birds don't tell us those things. But there are theories about bird nesting behavior and it might be of interest to you and your class to investigate and formulate your own theories.

There are many beautiful things to see in the spring. Some of the most beautiful things are nesting birds, eggs, and newly hatched young. The delicateness and beauty of these things are conveyed by sight alone. Normally when a nest is disturbed, the adult birds will make some defensive effort to drive off the intruder.

The best places to look for birds' nests are in parks and areas with low trees and brush. Evergreen trees are very attractive nesting sites for robins, purple grackles, and mourning doves. Nests will be found in these trees which are low enough that youngsters can see and study them without climbing the trees or damaging the nests. Most bird species will lay a fairly consistent number of eggs per nest and the eggs will have a characteristic size and color.

May is the best month for seeking bird nests. Shelterbelts, parks, hedge rows, overgrown fence rows, etc. are the best places to look for nests. It would be beneficial to make a survey trip to locate nests prior to the field trip and flag the trees so nests can be found again.

ACTIVITY:

Introduce the activity with questions. Also, you might build up to this activity by studying birds from books and a field trip from the school grounds.

What are birds? Describe one to me. List its characteristics. Some examples are as follows:

1. feathers
2. two wings
3. two feet with claws
4. bills
5. warm blooded
6. lays eggs
7. builds nests

How are birds different from mammals or insects?
Have children list as many kinds of birds as they can think of.
What does each kind of bird eat?
Where do they stay or live? Do they migrate or stay here all winter?
Where does each kind of bird nest? In trees, in bushes, on the ground?
How many eggs does it lay? What color are the eggs?
What does each bird make its nest out of?

You may want to make this a long activity and have a picnic lunch. Be sure to stress that the students do not disturb the nests any more than necessary. It generally does no harm to frighten the bird off the nest and look at the contents as long as they aren't touched.

Have the students spread out in pairs to look for nests. If you have already surveyed the area, you might discretely guide some of the laggers into finding nests. When the nests are found, have each student record data about the nest and the bird that was in it. Stop the nest seeking after 45 minutes and have everybody collect at a comfortable spot. Sit down and discuss for about 10 minutes what you have found.

Make a data chart which answers the questions posed in the pre-activity. Review the questions and discuss them.

Following are suggested questions that might be used:

1. Did you find quail nests in trees? Why or why not?
2. Robins' nests on the ground? Why or why not?
3. If you wanted more quail to build nests, what kinds of places would you make for them?
4. What kinds of trees did you find the most nests in?
5. What kinds of trees had the most different kinds of nests?
6. What kinds of trees should you plant if you want lots of birds around?
7. Did you find duck nests in trees? Why or why not?
8. When did you find duck nests? If you want lots of ducks around, what kind of places should you provide for them?
9. If you wanted more doves to nest around your house, what could you do?
10. How many birds nested in grass or made nests of grass? Is grass important to nesting birds? Which birds get the maddest? Which birds are the best parents?
11. Which birds lay the most eggs?
12. Which birds' nests were hardest to find?

STUDYING PARTS OF AN INSECT

OBJECTIVES:

1. To acquaint the students with the basic anatomy of insects by studying the grasshopper.

MATERIALS:

insect nets (optional)
jars

BACKGROUND:

Insects are the most abundant group of animals on the earth. They are present everywhere on the earth that man has been. Apparently none were present on man's recent journeys to the moon. The reason that they have global distribution is their ability to adapt to various situations. It is very evident that they have evolved differently when you compare the looks of a butterfly or an ant. They definitely don't look much alike. However, they have basic parts which are comparable. All insects have three pair of legs, three body regions, jointed appendages, compound eyes and a variety of other characteristics.

Because the insects are very abundant and are an available source of materials for scientific studies, they are used extensively for experiments. Many of the factors which control insect populations are also controlling factors in larger animals. The students will be interested in examining the insects under a microscope. This will enable them to distinguish different parts, designs, colors, etc. The grasshopper appears to be widely accepted as an example of a typical insect. We will use him to demonstrate the different parts of an insect. They are very abundant in the early fall, so this is an ideal time to study them.

ACTIVITY:

Introduce the activity with questions similar to the following:

1. How do insects move around?
2. Do they always move the same way?
3. Do all insects look alike?
4. Do they have eyes?
5. How many legs do they have?
6. Do they all have wings?

Go out and collect some grasshoppers and look them over. Where do you think we could find some grasshoppers?

Give each student a chance to collect three or four grasshoppers each and put them into jars. If enough nets are available, this should take only 10 to 15 minutes for the entire class. The variations of the individual grasshoppers will be interesting for the students to see. Many of the grasshoppers will vary in color and size, but will be the same kind of grasshopper.

Kill the grasshoppers by putting hot water into the jars. Two or three minutes should be sufficient if the water is very hot. Study the grasshoppers under a microscope. Have the students draw a diagram of the grasshopper and label as many parts as they can.

WHAT LIVES IN WATER?

(A Fishless Aquarium)

OBJECTIVES:

1. To introduce students to the use of microscopes and a study of microscopic animals that live in water.
2. To introduce students to the concept of pollution and how it relates to the food chain.

MATERIALS:

1. Microscopes
2. Hand lens
3. Microscope slides
4. Methyl cellulose (a solution for slowing down aquatic life so you can study it more easily.)
5. Pictures of water life for identification
6. Eye dropper
7. Paper plates (Chi-Net)

BACKGROUND:

Hours of investigation can result from a simple pond water aquarium. Children are fascinated by the creatures found in this water and can easily become familiar with them. In addition, it gives the teacher an excellent opportunity to introduce the concept of the different environments. This activity can be started in September and finished in May, or it can be done in one afternoon.

The essential part of this activity is finding a good source of water life. In fall and spring, any lake, pond, creek, or slough shoreline will have an abundance of life. Look under and on rocks, in algae clumps, in mud, and on water plants. During the winter, good samples can be taken at springs, riffles in streams which do not freeze, or under ice near the shoreline.

ACTIVITY:

1. Introduce the study of water animals. Make a bulletin board on the different animals that live in water. This builds up the curiosity and adds to the enthusiasm of the students.
2. A finger play "Five Little Animals"
   Five little animals, swimming in the lake --
   The first one said, "Swimming is great." (Swim with hands)
   The second one said, "Hey, wait!"
   The third one said, "Let's swim away." (Swim with hands)
   The fourth one said, "Let's stay."
   The fifth one said, "Come over and play." (Motion with finger)
   Then along came a big fish. (Make hands look like fish)
   And the five little animals swam away. (Swim away with hands)
3. A story on the different animals could be read--for example: "The Scud Book"
4. The following questions might be asked:
   Where is water found? (Lakes, streams, ponds, rivers, etc.)
   What do we use water for?
   What color is water?
   What does water smell like?
   What lives in water?

Take the students to a nearby pond and have each student collect a water sample. Each student should try to get some gravel and mud in the bottom of the jar. Then get some water with plant and animal life in it. (If this is impossible, the teacher could collect one large sample for the entire class.)

After the mud has settled, children can study their water samples.

1. Does the container have creatures swimming in the water?
2. Are there creatures on the side of the jar?

After this brief discussion, set up microscopes for a more detailed study of the animals. Give each student a sturdy paper plate to put his water sample on (the Chi-Let brand is good), an eye dropper, and a glass slide.
Explain what to do and how to use the equipment. Students will observe the animals for hours. If you want to keep the aquariums, put the water back in the jars and keep in a sunny, cool place. Otherwise, just throw the water samples out. If you keep the samples, make observations every day.

1. Does my jar have the same creatures as everyone else's?
2. Does my jar have as many creatures as the day before?
3. Is the color of my water the same as everyone else's?

These aquariums will last for several weeks. To assure this, some precautions should be taken: (1) Don't add food to the water; (2) Add distilled water if the pond water evaporates; (3) Keep the jars in a sunny, cool place.

Many of these organisms are beautiful and could serve as subjects for an art lesson.

1. Encourage the students to draw, color, and describe what these creatures look like and act like.
2. Fishy Finger Painting (refer to art booklet)
3. Fishless Aquarium with waxed paper (refer to art booklet)

Set up a pollution activity by adding different substances to the water, such as soap or detergents. Add a drop of one of these to the water each day, and watch the change. Discuss what happens.

As part of the field trip, try this game:

Fish Eye View"

At the pool, beach, pond, or lake, look at the world from water level. What can a fish see?

Tell a story about the activity.

If you keep the aquarium, try to count the animals each day to see if they vary from time to time.

THE FOOD CHAIN

OBJECTIVES:

1. To acquaint students with the laws of nature.
2. To establish the importance of all living organisms.

BACKGROUND:

According to an article in the Brookings Register, approximately 90% of the creatures that lived on the earth at one time have become extinct. The evolutionary process operates on the basis of survival of the fittest. Those creatures that have a narrow limit of tolerance have a hard time adapting to the changing world. Pollution speeds this evolutionary process along by elimination of these species which cannot adapt. Therefore, pollution is not all that bad -- right? Wrong! Why should one species (man) eliminate any living thing? We depend on other forms of life and we need them for our survival. All living organisms have a place on the earth and contribute to a complex balance. We should not try to disrupt this balance any more than we absolutely have to.

Finding and identifying food chains on field trips is not easy. It takes some preparation and planning. Once you find an example, it will change daily and disappear without a moment's notice. However, center the students' attention on evidence of links in the food chain. Dead animal remains, piles of feathers, bird and animal manure, regurgitated owl pellets, tooth marks on corn and branches, etc. all are examples of evidence to support a food chain concept.

ACTIVITY:

Introduce the activity with questions similar to the following:

1. Does anyone know what a food chain is? Explain it with a diagram.
2. What do insects eat? Do they eat plants? Do they eat other insects?
3. What do birds eat? Do they eat grain or weed seeds, or do they eat insects?
4. What does a cow eat?
5. What do people eat?
6. Has anyone heard of the saying,"survival of the fittest?" What happens to a deer herd in the winter when there is a food shortage? Do they all die? Why do some live? Do you suppose it is the same with all living things?

Take the students to a park or any other outdoor site. Ask them to find examples of insects eating plants and insects, or of birds eating insects and plants and/or plant parts. Point out animals eating grass or the other kinds of plants, and show students examples of nests and cover areas.

Set up a chart with all the examples of mammals, insects, plants, birds, etc. seen on the field trip. Describe the things they ate or what eats them. The students should all be able to construct food chains when they finish. Some simple examples are as follows:

grass -- cow -- man
grass -- insect -- bird -- fox --
killed by man for fur, bounty, or sport
grass -- insect -- grouse -- man

WHAT DO WILD CRITTERS EAT?

OBJECTIVES:

1. To introduce students to the ideas of the dependency of plants and animals on each other.
2. To help children learn how to investigate.

BACKGROUND:

One of the first questions asked by children after they discover what a bird, animal, or insect is, is "What do they eat?"

In man's management of the environment, it is essential that he is careful to include food for wild things as well as for himself.

Many creatures have very limited feeding habitats. Some insects will eat only milkweed sap. If we destroy that food source, they will eat nothing else. Man has done this to many creatures. Did you know that the passenger pigeon ate almost nothing but acorns, hazel nuts, hickory nuts, beech nuts and other mast? And in the 1800's, man destroyed vast areas of nut tree forests. Some scientists believe that our destruction of the forests for lumber and firewood was as important in destroying passenger pigeons as market hunters.

It is an interesting exercise to have children look for signs of what animals eat, the plants they favor, and what they leave behind.

MATERIALS:

1. paper bags or cloth sacks
2. magnifying glass or dissecting scope

ACTIVITY:

Introduce the activity as a scientific study of food for creatures. Use this study in conjunction with your regular bird, insect, or mammal units. Ask the children to help you think of foods for different kinds of animals. List them. The following questions might help:

What do sparrows, pigeons, and doves eat?
What do robins, wrens, warblers, and blackbirds eat?
How do you know? Did you watch them eat? Or hear what someone else saw one eat?
What do hawks and owls eat?
Why don't hawks and owls eat corn?
Why don't pigeons and doves eat meat?
Do most birds eat meat or plants? Why?
Where do you see most bir_ eating? Why?

Repeat the above questions for mammals and insects adding the following:

Did you see any evidence that plants ate insects, mammals, or birds?
Did you find any evidence that plants needed animals or birds for anything?

If we scare all of the birds away, how can we tell what they have been eating? Let's be scientific detectives and make a field trip to find out. Let's look for clues and evidence. Local parks and school grounds are good places to look for clues.

Make a list of evidence and clues. Ask the students to do the listing.

1. Seeds on the ground.
2. Holes in seeds or plants or bark.
3. Holes in leaves and fruits.
4. Manure piles
5. Feathers and bones.

Make posters showing the evidence collected. Sort evidence into animal, bird, and plant categories. Follow up with questions. Here are a few you might find helpful:

1. What kinds of food do lots of animals eat? Do we eat that type of food?
2. Did you find food that just one kind of animal eats? Why? Do people eat that for food?
3. Do most animals eat plants or other animals?
4. Do most birds eat plants or other animals?
5. Do most insects eat plants or other animals?
6. Did you find places where there were no signs of animals eating things? Why?

Try to piece together picture stories of critters all eating food like at a banquet table.

Try putting out food stations and bird feeders to study eating habits of birds and mammals.

PLANT AND ANIMAL COMMUNITIES

OBJECTIVES:

1. To acquaint the students with characteristics of plant and animal communities which will enable the student to recognize them.
2. To introduce the students to study a study of these communities in a systematic manner to bring out differences in a graphic manner.
3. To acquaint the student with the relationships and interdependency of plants and animals.

BACKGROUND:

A community is much easier to show someone than to describe. Generally, a plant community is a rather easily identifiable unit. The animals which are there pretty much are dependent upon the plants and the food and shelter they provide. If you wish to do a study of plant and animal communities, then you must find a selection of identifiable plant communities like a cornfield, a pasture, a creek bottom, a slough, or a shelterbelt. The animal life which is dependent on each of these will leave signs which will indicate how the animals are dependent on the plants and also how the plants depend on them. For example, a plum thicket may have many signs of raccoons in manure piles scattered around under the trees. Coons use plums for food, and in eating the plums they help the plants by distributing the seeds and depositing them away from the parent tree with a good rich source of fertilizer to help the seed grow.

The size of the plant and animal community will vary with the animals with which you are dealing. The plant and animal community of which man is a part, is a much larger entity than that of a cottontail rabbit.

MATERIALS:

1. paper bags
2. measuring tape

ACTIVITY:

Introduce the topic of plant and animal communities by asking questions and discussing man's communities and the plants which support him. Sample questions are as follows:

1. Is man part of a plant and animal community?
2. How can you tell?
3. What are the plants which we are dependent on in our community? For food? For protection? For nesting (houses of wood, cotton, and blankets and clothes) For recreation? (lows, trees, flowers)
4. Do we help the plant communities? How?
5. Do our plant communities grow without help?
6. What are other animals which live in our community which we are dependent upon?
7. Are wild animals found in communities, towns, or cities?
8. How do animals help plants? (scatter and bury seeds, thin out crowded plants and allow light in for others, eat insects which damage plants, fertilize and air out the soil.)

Split the class up into two teams: one which is responsible for plant collection and identification; the other which is responsible for finding, identifying, and recording animal signs.

Explain a mapping technique. Explain the identification of plant zones and mapping them.

Have the students measure a strip 100 feet wide that runs through varying habitats. Have them measure the length of the different zones. Have the plant group collect plants from the different zones and identify the plants and list the most common types. Map the different zones as to plant location. Have the animal group look for animal signs in each area, listing each type and the most common type. They should also collect scats, nests, etc. They might also record by mapping the location of the outstanding animal signs.

Complete and discuss the maps. Complete the identification of plants and animal signs when possible. Have the children investigate the animals and plants in reference books. Wrap the activities up by repeating questions of the activity. Ask the students to define a plant and animal community. Ask the students to describe and list the components in the plant and animal community of which they are a part.

OLD BIRD AND ANIMAL NESTS

OBJECTIVES:

1. To acquaint students with different types of bird nests and nesting materials.
2. To introduce students to bird preferences in height and type of tree.
3. To introduce the idea of animal dependency on other animals.
4. To introduce the idea of plant dependency on other animals.

MATERIALS:

large paper bags -- one per student
one or two-step ladders

BACKGROUND:

1. Different bird and animal species use different materials for nests.

2. Different bird and animal species use different nest patterns.

3. Different bird and animal species use nests at preferred heights in preferred trees at preferred sights.

4. Certain insects and mites depend on nests for places to hide in the winter and for food.

5. Mice and shrews use bird nests for storage bins, resting platforms, and nests.

6. Nests many times contain seeds which will grow with the help of fertilizer from the nest when the nest falls.

7. Old nests are not used the following year by birds found in the area. You need not worry about harming the environment by collecting them.

ACTIVITY:

Discuss bird and animal nests. List bird nests of different kinds, shapes, materials, places, and heights. Ask the students if birds and animals prefer certain nesting places or do they nest anywhere.

The following are questions you might ask:

1. What happens to the nest when the birds have abondoned it?
2. Do any other birds use it?
3. Do any mammals use it?
4. Do any insects use it?

Go to a nearby park or natural area and look for old nests in the late fall or winter. (Mice, squirrel and/or bird nests; collect one or two per person or team.) Give each child a data sheet on which to record information about the nest site.

Collect nests after observations are made on height of the nest, type of tree, shape of nest, and guess or estimate what bird made it.

1. Make a nest display collection - determine the kind of nest.

2. Make up a story about each type of nest including evidence the students found in it. Some examples of evidence are listed below:

   a. mouse droppings
   b. feathers
   c. seeds
   d. insects
   e. mud
   f. pieces of plastic
   g. Skeletons and egg shells

3. Dissect nests to see what they are made of. List the things that you find. For example:

   a. twigs
   b. grass
   c. mud
   d. feathers
   e. string
   f. plastic
   g. horse hair
   h. wool, etc.

4. Plant some nests as you would seeds and watch to see what kind of plants grow and how many seeds grow from each nest.

5. Ask the following questions:

   1. What kinds of nests did you find?
   2. Which kind had the most seeds in it?
   3. What was the favorite nesting material?
   4. How many kinds of animals used the bird nest?
   5. How many kinds of birds used animal nests?
   6. Which nest had the most bugs in it?

TRAPPING INSECTS AND KINDS OF BUGS

OBJECTIVES:

1. To acquaint students with insects. A great variety of insects are present around us, most of which we are unaware and most of which are beneficial.
2. To acquaint students with the concepts that different insects eat different things and live in many different places.
3. To acquaint students with methods of catching and studying insects.

MATERIALS:

1. glass jars, coffee cans
2. baits
   a. sugar syrup
   b. molasses
   c. meat
3. several hand spades
4. insect sweep nets

BACKGROUND:

Insects are the most numerous land animals on earth. There are over a million species (different kinds of insects) present. Insects occur in nearly every kind of place, on nearly every kind of plant and animal. Some kinds of insects can be found which eat any kind of plant or animal product.

Most insects are beneficial to us. Bees pollinate our fruits, vegetables, and crops and give us honey. Ants eat other insects, aeriate the soil and clean up waste products. Dung beetles eat manure and cause it to rot and become soil. Carrion beetles eat dead animals and cause them to rot and become soil. Water insects serve as fish food.

A very few insects actually harm man and his crops. These are, however, serious problems to us and man must control and kill these harmful insects at times.

Insects are interesting to study and are very easy to use as study creatures. Many very valuable ideas can be reached using insects related to food habits and habitat needs.

ACTIVITY:

Introduce the topic of insects (bugs) with questions similar to the following:

1. What is an insect like?
2. How is it different from a bird?
3. How is it different from a mammal?
4. How many legs do bugs have?
5. Do bugs fly? Do they have wings?
6. Where do you find bugs?
7. How can you catch bugs?
8. List all of the kinds of bugs the class can think of.

a. flies
b. mosquitoes
c. beetles
d. grasshoppers
e. worms
f. butterflies
g. moths
h. caterpillars
i. fleas
j. dragon flies

9. Where do you find these kinds of bugs?
10. What do these bugs eat? How do you know that is what they eat?
11. How are beetles different from butterflies?
12. Are all beetles the same?
13. How many good bugs can the class think of? List them. How do they know the bugs are good?
14. List bad bugs. Why are they bad?
15. What is the best way to catch bugs? Where could we go to find the most kinds of bugs?

Suggest a field trip to investigate bugs. Set up a bug trap line. Have each student bring a jar or smooth sided can. Have each child bring some type of bait.

After a two or three day interval, take another field trip. Have the children sneak up and cover their jars with a lid. Then dig out the cans or jars and look at their contents. Fill in the holes and return to the classroom. Kill the insects by pouring hot water into the jar or placing the jars overnight in a freezer. Remove the insects from the jar and paste them on a piece of paper with glue or pin them to cardboard sheets with common pins. Answer the questions posed in the pre-activity.

MAKING AN ANT FARM

OBJECTIVES:

1. To observe the wondrous ways of nature.
2. To emphasize the values of cooperation.

BACKGROUND:

Ants are fascinating! Scientists have discovered that nearly every important human industry and many human habits and characteristics are common among ants. In the anthill can be found two kinds of ants: the queen and many many workers. The queen has the most important job--laying eggs. The workers carry on all of the other activities. Each worker has a specific job. Some are builders, carpenters, doctors, farmers, masons, miners, nurses, policemen, servants, soldiers, undertakers, etc. Their cities contain hospitals, cemeteries, playgrounds, and nurseries--all connected by paved roads or tunnels. Some anthills even contain beauty parlors and dairy barns.

Ants have two food requirements: food must be liquid or easily scraped into tiny pieces. Dead insects are a favorite meal for most ants. Plant juices, fruit, and seeds are also enjoyed by the ants.

ACTIVITY:

What is an ant?
Where do ants live?
What do you think an anthill looks like outside? Inside?
Discuss the structure of an anthill (the tunnels and rooms.)
Have you ever watched the ants around the anthill?
What were they doing? (Discuss the different jobs of ants.)

Find an active anthill and dig to the center of it. Carefully lift the gravel and dirt out and place it in a gallon jar or glass container. While digging, try to take samples from different areas of the hill. By doing this you will be getting a variety of ants, activities, and hill materials. The ants will rebuild the hill in your jar. Take the jar back to the classroom. Place a piece of sponge or ball of cotton on top of the dirt, and water every few days.

It is a good idea to know where the anthill is before the field trip. Let the children discover the anthill on the field trip.

Feed the ants crumbs, bits of apple, caterpillars, and freshly killed insects. Cover the top of the jar with a screen. For the first few days, cover the sides of the jar with black construction paper. The ants will dig their tunnels on the edge of the jar, and when the paper is removed, the children will be able to observe the ants working.

RAISING EARTHWORMS

OBJECTIVES:

1. To acquaint students with the importance of earthworms.

MATERIALS:

jar (large)
screen
hand spade
earthworms

BACKGROUND:

Earthworms and also night crawlers are a common worm found in moist warm soil in many parts of the world. Earthworms contribute to the growth of plants. The worms help break down the decaying matter in the soil. The air necessary for plant growth enters the soil through the tunnels dug by earthworms. They are important food for birds, also. Earthworms feed on dead plant material in the soil. The earthworms in an average acre of good fertile soil will consume, digest, and revitalize over 15 tons of earth in a year's time.

ACTIVITY:

Ask these questions to create an interest:

What is an earthworm?
Where do earthworms live?
Why do you think they are called earthworms?
What do earthworms eat?

Go on an earthworm hunt. Hunt around (moist soil is important), look under rocks; dig into the soil. Dig around until you find some earthworms. Fill the jar about 3/4 full of good rich soil, add some earthworms. Take the jar back to the school. Cover the top of the soil with burlap, add water. For the first few days, cover the sides of the jar with black construction paper. The earthworms will dig tunnels along the edge of the jar and when the paper is removed, the students will be able to observe the earthworms easily.

Keep the jar in a protected, shady area. Feed the worms at least once a week. Earthworms can be fed almost any organic substance that breaks down easily--table scraps, coffee grounds, cornmeal, kitchen fat, discarded vegetables or leaves.

THE INSECT ZOO

OBJECTIVES:

1. To observe closely some of the insects common to the environment.
2. To add some interest to common curiosity about the insect world.

MATERIALS:

anything that is suitable for an insect cage.

BACKGROUND:

Children are easily amused by anything that crawls, flies, or creeps. How many times have your students brought you a small jar containing some insects? Then, in turn, the jar is set on a shelf and forgotten. Why not utilize the jar, the insect, and the student's interest and create an insect zoo?

Simple cages can be made from almost any container that you happen to have on hand. Directions for some cages are included in this unit. The students will be in charge of cleaning the cages and feeding and watering the insects. Insects will have to be fed a similar diet which they are used to. This will probably require some research, but with the younger children, this can be accomplished. They love to look for information. Have on hand simple books about insects. With the guidance of the teacher, the students should be able to help.

ACTIVITY:

1. Decide on the cages you want to make; gather the materials needed. These can be made from plastic boxes, jars, lamp chimneys, oatmeal boxes, Pringle boxes, etc. Fill the bottom with some dirt. Top this with grass sod. Insert a twig or small branch for the insect to climb. Be sure to water the soil.

2. Take a field trip to collect insects or set insect traps. If there are plants, trees, and grass on the school grounds this excursion could be accomplished there.

3. Collect the information on the feeding habits of the insects caught.

4. Try to make the cages resemble the natural habitat of the insects.

5. Watch and study the insects, record the changes of the insects, and and other data.

APPENDIX B

Plants

OBJECTIVES:

1. To acquaint the students with the type and characteristics of nonflowering plants which are important to them.
2. To introduce students to an awareness of what these organisms are and where they can be found.
3. To provide students with methods of studying them.
4. To acquaint the students with the ways these organisms have an impact on our lives.

MATERIALS:

one jar per student, rubber boots, plastic or paper bag, a knife or a screwdriver may be handy
dissecting scope and slide making equipment

BACKGROUND:

Among the organisms which play an essential role in the good health of the environment is the diverse grouping called nonflowering plants. Generally, these include the diverse groups of algae, fungi, mosses, ferns and lichens. Most of us recognize some of the common types on our yards but few of us realize the importance of these organisms to humans and more important, to the health of the environment.

Types of algae which are common in our area are the blue-green, green, motile flagellates and diatoms. These are found in all of our water, moist soil, moist bark, etc. They are perhaps the easiest group to find and study.

Common fungi are the toadstools, mushrooms, shelf fungi on trees, molds and puff balls. These usually require moist places to grow, and at times many of these organisms are difficult to locate. They can be found, grown and studied in detail with little effort if proper preparations are made.

Mosses and ferns are found in moist habitats in this area. Mosses grow on the north side of roofs in the shade, on tree bark, old stumps, etc. Ferns can be found in densely shaded wet areas, but are not abundant generally in this area.

The lichens are very abundant and can be found on nearly every rock and tree in this area. There are several common types of lichens present which are found on tree bark and old wood. Several other types are found commonly on rocks.

Algae serves to take the nutrients out of the water and energy of the sun and start them into the food chain. Algae serves as fish and insect food. It also provides oxygen for the air and water animals.

Fungi are parasitic and saprophytic. They must get their food from dead or living organisms. Fungi which feed on a living organism are athlete's foot and ringworm. Most of the fungi we are familiar with feed on dead organic materials. And in feeding on this material, fungi serve to break it down into elemental forms which can be used as food for flowering plants. Fungi serve to put some elements and nutrients back into the food chain.

Lichens are algae and fungi living together in a very close relationship called symbosis. You can put lichens on a food material which poisons the algae and get a fungi growth which is much different in color and shape than the lichen. The same can be done with the algae. Lichens are exceptionally tough. They live in the most hostile climates and thrive. Lichens are very important to us for they break rock into elemental forms and soil which can be utilized by other plants. They are also instrumental in the decay of wood.

Mosses and ferns play a diminished role in this area as decomposers of organic matter. It is generally too dry on the prairies to support vigorous moss and fern growth. They are present and interesting to study. In the more humid areas of the country, they are extremely important as decomposers and even as food for higher animals.

The shapes, forms and ecologies of these organisms are interesting to study.

ACTIVITY:

Assign students to looking up information on algae, fungi, lichens, mosses and ferns. Have them bring pictures. Spend some time discussing these plants and the importance of them to our environment. Here are some questions which might be helpful:

1. What is algae?
2. Where can you find it?
3. How is algae different from grass?
4. Describe algae.
5. How is fungi different from algae, mosses, and ferns? Where do you find the different kinds of fungi?
6. How are molds and fungi important to us?
7. Describe a lichen.
8. What makes up a lichen? How is it different from algae or fungi?
9. How is it different from a weed?
10. Why are lichens important? Where can they be found?
11. What do mosses look like and where do they grow?
12. Where can mosses be found?

Collect algae at the edge of a pond, slough, creek or shaded area. Lots of algae grows on rocks and other plants in our local lakes and streams. Have them put a little glob of algae in the jar along with some pond water.

Lichens are found in abundance on old fence posts, tree bark, rocks and logs. Shelf fungi and fungi associated with dead or dying trees are the most common in this area. An older shelterbelt or tree stand is also a good place to explore.

Mosses are also abundant on the shaded sides of tree and stump bases in the Wetlands woodlot. Ferns are more difficult to find in the area. Lichens, mosses and fungi can be placed in plastic bags and returned to the classroom for study.

The teacher should act as a guide to help find the fungi and other plants. Caution the children to take small samples of the fungi and moss; there is some danger of depleting the fungi supply in an area for other classes if children collect all they find.

Algae can be best studied using compound microscopes or microprojectors. There are many shapes, forms and colors of algae. Some swim like animals. They fascinate children. Let kids make slides and draw the different kinds of algae they find.

Lichens have beautiful shapes and colors and have sculpturing reminiscent of sand dunes. Have the children compare colors and shapes to determine how many kinds were found.

Fungi can be examined microscopically and compared as to types, colors and textures. Molds and other microscopic fungi can be studied with the aid of microscopes used on the algae.

The shapes and structures of mosses and ferns can be compared and posters might be made of the different types.

Repeat the questions asked in the pre-activity. How are these plants importamt to man? What were they doing in the places you found them?

WHAT DOES A SEED NEED?

OBJECTIVES:

1. To acquaint students with the various types of seeds and where they can be found.
2. To give students an opportunity to plant seeds and to come to a basic understanding of seed germination.
3. To further student understanding of what is needed for a seed to grow.

MATERIALS:

wide variety of seeds collected on field trip
paper bags
soil for planters
milk cartons

BACKGROUND:

Students are sure to be fascinated by this activity if they are allowed to come to their own conclusions about seeds and what a seed needs to grow. Children often grow plants in their classrooms and teachers often tell them that the basics a seed needs to grow are: 1. Soil 2. Water 3. Sunlight

WHY NOT LET THE CHILDREN MAKE THESE DISCOVERIES BY THEMSELVES?

ACTIVITY:

Introduce the topic with the following fingerplays:

A LITTLE SEED

A LITTLE SEED SO SOFT AND ROUND,
(Fingers form a circle)
I'LL DIG A HOLE AND LAY YOU DOWN;
(Digging motion)
AND YOU MAY REST BENEATH THE GROUND
(Cup one hand, lay the other over it)
UNTIL YOUR LEAVES COME UP,
(Point upward)
AND YOUR ROOTS GO DOWN.
(Point downward)

The following are questions which might be used:

1. What are seeds?
2. What do people use them for?
3. What do animals use them for?
4. Where do they come from?
5. What kinds of seeds can you think of? (Make a list)
6. Have you ever planted a seed? What kind? Did it grow? Where did you get it? What did you do to make it grow?
7. What kinds of seeds does your father plant? Your mother in her garden?
8. Would you like to try and grow some seeds?
9. Where should we get some seeds to grow?

Give each student a small paper bag. Take them on an outing and have them collect as many kinds of seeds as they can find. (The fall is a perfect time of year for this activity because of the great abundance of seeds which are found on many kinds of plants).

Have the students empty the contents of their sacks on papers on their desks and sort them into various groupings -- for example, kinds, sizes, colors, shapes, etc.

Next, have the children plant one of each kind of seed in the planter. (It might be a good idea to tape or paste the seed which will correspond to the plant on the side of the planter so that the students are able to see later which seed the plant grew from).

Discuss what was needed for the seed to grow. To emphasize certain elements basic to plant growth, divide the class into groups and set up various seed germination conditions which will eliminate or adjust the following conditions:

1. moisture
2. sunlight
3. covering for cartons
4. temperature extremes

The children should be able to make a reasonable conclusion concerning the basics that a seed needs to grow.

DANDELION WATCH

OBJECTIVES:

1. To acquaint the students with dandelions.

BACKGROUND:

There are many times that you would like to take the kids outdoors just to get out of the classroom in the spring. This activity is designed for that type of day. Usually, it can be done on the school grounds. While dandelions may not excite you too much, they are a valuable learning device for students. There are many different studies that can be done with dandelions. They are cheap to use, are normally abundant and are usually close at hand. For that reason, this activity is good to consider in the spring. It is not necessary to limit the activity to just dandelions. Any spring flower will work equally well.

ACTIVITY:

The kind of questions and preparations you use will depend on the grade level you are working with. Some suggested questions are as follows:

1. What is a dandelion?
2. What color are its leaves?
3. What color is the flower?
4. Does the flower change color? Why?
5. What color is it when it changes?
6. What is it called when it has changed color?
7. How many leaves does the plant usually have?
8. What kind of soil does it grow best in?
9. How long does it take the plant to flower?
10. How long does it take for the flower to change to a seed head?
11. How many seeds does it produce?
12. What is the white stuff in the leaves?
13. Can the white substance be used for anything?
14. How many dandelion plants are on the lawn?
15. How can we find the number of dandelions there are without counting all of them?
16. Could we find out the number of dandelions there are in an acre?
17. How many new dandelion plants could be grown if all of the seeds grow into new plants?
18. What are dandelions used for?
19. What is germination?
20. How long does it take for dandelion seeds to germinate?
21. Do all of the seeds germinate?
22. How long does it take for the dandelions to germinate?
23. Do they all germinate at the same time?
24. What is the average length of germination?
25. How many generations could be produced on a 90 day growing season?
26. If they all lived, how many plants would that be on an acre?

This activity can be carried out on the school grounds if necessary. Many people will volunteer their lawns as study areas for dandelions if you will have the children pick them after the study is over. The area you study works best if it is secluded. For the early primary grades, identification of the dandelions and watching them change their life cycle will be sufficient. They will be fascinated by the change in the dandelion. They can all pick out a plant to watch. A little flag can be used as a marker to help them identify their plant. They should return to the dandelion at least twice a week so that they can notice the gradual change in the dandelion. The upper primary grades can get involved in population counts, germiation rate and percentage, anatomy, length of life cycle and needs of the dandelions. You may be able to think of other possibilities. With this age group, you will need to set up a study area.

For the primary children, a good post-activity would be to try growing some dandelions in the classroom with the dandelion seeds from the plant they watched grow. They can also time this process to see if everything is the same indoors as it was outdoors.

The older children are fascinated by the mathematics activities which can be done around this unit using percentages, fractions and numbers in the thousands to millions. This will give them a chance to use the mathematics they have learned in a practical way.

AN AUTUMN SEED AND BUR ACTIVITY

OBJECTIVES:

1. To introduce concepts that plants have developed hooks, spines, and needles on seeds and seed pods which enable seeds to attach to passing animals and thus disperse. It draws attention to the interaction of plants and animals in a positive sense.
2. This activity helps children become aware of a variety of the plant adaptation for dispersal of their seeds; parachuting types, bright seed pods to attract animals and birds who eat them and distribute the seeds, etc.
3. Children become aware of the protective function of seed pods. (Do birds eat cockle burs, burdock burs or buffalo burs?)
4. To introduce the concepts of seeds, seed growth and survival dependent on natural and induced conditions.

BACKGROUND:

This activity is intended to be for grades 1-3. It is simple. Determine what type of cloth collects burs and stick tight seeds best. Have the children wear these and go on a field trip. Upon returning to the classroom, pick off the burs and seeds and examine them. Do some follow-up experiments with growing, the seeds and identification of them.

ACTIVITY:

Children may be requested to bring different samples of scrap fabrics from home, or they may use the clothes they are wearing for the activity.

Introduce the activity to the children as a study of plants and seeds. Mention that they will be going on a field trip to study them where they grow. Question them about plants: Where do they grow? What is the student's favorite kind of plant? What kinds do rabbits, birds, etc. eat? Ask them how many ways they can think of that plant seeds get scattered.

Discuss with them in preparation for the field trip that they should know what type of clothes to wear for collecting plant seeds. Pass around the different types of cloth the children brought from home, or a selection is available from the Interlakes Office. In addition, the students may use the clothing they are wearing.

Pass around a selection of burs collected previously and have the students determine which type of cloth burs stick to best.

Encourage them to wear that type of clothing for the field trip. Hopefully, they will find that wool or rough cotton will catch burs best. Leggings can be made by cutting the toe out of a pair of their father's old work socks, long johns, or wool pants and pulling them up over the trousers so that the socks cover the child's socks and lower legs. This protects the childrens' clothes. The old sock can be taken off with the burs attached and saved for later use. This minimizes bur picking from the school clothes upon return from the field trip. We suggest that the students concentrate on bur producing plants. However, they will collect every plant with stickers and many without.

Pick out a nice, weedy, brushy area in which to have a Bur-In activity. A vacant lot or an old field that has grown up to weeds will also be fine. The teacher may want to ask the class for suggestions on good places for a Bur-In. Check out the area before the field trip. If there is a poison ivy patch in the area, you will have to take some precautions.

Go to the site of the Bur-In. Roll, walk, run, skip in the grass. Play hide-and-seek, pick up litter, look for interesting discoveries, walk through tall weeds, form a long line and walk side by side, arms distance apart across the area (this procedure might also scare up some mice, rabbits, birds, etc)

Collect samples of as many kinds of plants which produce burs or sticky seeds as the children can find. Put them in paper bags to take back to the classroom.

If you plan to follow through with the planting experiments, assign one or two students to collect a pail full of dirt from a fox or gopher mound in the area to use for planter dirt.

Upon return to the classroom, remove the socks, roll them up and place them in paper bags. Pick off burs from other clothing and place them in the bag with the socks. This is a good place to stop for a day or two before proceeding into the follow-up activity.

Return to the classroom and have each child remove the burs from his clothing and put them on his sheet of white paper.

Glue examples of each type of sticky seed to a large poster board or a long sheet of white shelf paper or butcher paper. If anyone has a sample of the plant that a particular bur came from, glue it up beside the bur.

Determine who has the most different kinds of burs and reward them appropriately. There might also be a reward for the person who has the largest number of individual burs on his sheet of paper.

Discuss everybody's burs. Some points for discussion might be:

1. Why do burs stick to people?
2. Do burs stick only to people?
3. What's inside a bur?
4. Which burs are the most effective?
5. What might happen to a bur that got caught on a fox's tail?
6. What kind of bur is most common?
7. Did different kinds of burs come from different locations?

Look at some of the burs under a magnifying glass.

Put a little gravel in the bottom of each box, then add the soil.

Also plant unrefrigerated seeds in the soil, marking each kind of seed on the cup.

Water the seeds occasionally -- very lightly, just to keep the soil from drying out.

WHAT'S IN A GOLDENROD GALL?

OBJECTIVES:

1. To introduce the concept of environment into a tangible media.
2. To introduce the process of environmental manipulation.
3. To introduce experimentation to demonstrate the effects of environmental damage to the survival of organisms.
4. To introduce the concept of plant-animal dependencies.

MATERIALS:

1-3 galls per student
sharp knife for cutting galls (razor blades also work)
wide-mouth jar
six outdoor-indoor thermometers
old sponge
old nylon sock
glue
dark construction paper

BACKGROUND:

What is a goldenrod gall? It is a weed stalk with an egg shaped swelling. The tall, common goldenrod plant remains standing throughout the winter, even though it is dead and dry. You find patches of these weeds in pastures, along railroad tracks, ditches, shelterbelts, stream banks and sloughs. Some of the weeds will have a large round swelling on the stem. This is a goldenrod gall.

A wasp, fly or midge starts the gall. The gall swellings are caused by goldenrod wasps, midges or flies which lay their eggs in the stem during the summer when the plant is green and growing. The inner lining of the gall is eaten by the insect larvae and serves as the only food of the developing insect after it hatches from the egg. The activities of the insect stimulates the goldenrod plant to produce this special formation. This gall then becomes the environment for the insect for eleven months of its life. This gall provides food, water, shelter from elements, protection from birds, predator insects and prevents it from drying out.

This tiny complete "environment" is much fun to work with and is very well adapted for use by elementary students learning about environment. The tiny grubs which are found in the galls have no legs or extremely tiny ones. They are generally of two body types. They are active in the galls during very cold weather and adapt themselves well for manipulations we subject them to. The insects do not bite or sting.

During the period of the experiment, the grub will change into a pupae or chrysalis for several weeks and then emerge as an adult. The children can prepare these galls so that they can view all of these happenings. The students might also experiment with these insects to test how changes in the insects' environment will affect its survival.

ACTIVITY:

Show the students several galls and ask them what they think they are. Ask them to tell what they think is inside the gall. Ask them to draw a picture of the gall. Ask them if they have ever seen galls before and where. Question them as to what they think environment is. What makes an environment?

This activity should be conducted in February or March for best results. Plan the field trip to an area that has been located beforehand and in which goldenrods are abundant. Take a paring knife or hunting knife along to cut off the tough weed. Put the galls in paper bag to carry the galls back to the classroom. Have each student find and collect at least one gall.

Set up teams before hand to carry out experiments, prepare jars and conditions of experiments during pre-activities. Present this to them as planning a scientific experiment.

This trip would not have to last very long and could be done in very bad weather. Children can be taken on a hike to look for birds, animal tracks, bird and animal nests, burs and seeds, etc. However, make the hunt for goldenrods the first priority and 'lead' them into gall areas without pointing them out. Collect about 1-3 per student depending on your class size. Carry the galls back to the classroom. You can store them for a week or so or use them right away.

There are many observations and experiments you can carry out using these galls. You may want to develop your own experiments with them or have the students suggest ideas.

MILKWEED POD BIRDS

OBJECTIVE:

1. To make a creative and colorful bird out of a milkweed pod.

MATERIALS:

Milkweed pods
scissors
tempera paint and brush
glue

ACTIVITY:

Cut a milkweed pod in half up to the stem to make wings for the bird. Place the wings on another milkweed pod which is the body. The stem of the milkweed body may be used for the head of a smaller milkweed. Glue the head and wings to the body. If tempera paint is used, two coats will be necessary. These milkweed pod birds look nice as a man's gift.

1. Cut a milkweed pod in half, for the wings.

2. Glue the pod cut in half on each side of another pod.

3. Paint the pod and features.

FORCING BUDS INTO BLOOM

OBJECTIVES:

1. To acquaint students with the characteristics of a bud.
2. To introduce students to the conditions a bud needs to open.
3. To familiarize the students with the many kinds of trees and shrubs in their community.

MATERIALS:

Branches with buds
water
plastic bags (lightweight)
household ammonia (optional)

BACKGROUND:

In many places, the winters are long and spring seems far away. When the students get restless and anxious for spring to come, try this activity. The activity deals with "bringing a 'sign of spring' into the classroom". With the excitement of doing the actual experiment, the students are learning valuable lessons on how and why buds do open and bloom.

ACTIVITY:

1. What are buds?
2. Why don't shrubs and trees bloom in the winter?
3. When do buds start to bloom?
4. What kind of weather is it then?
5. Are all buds the same size?
6. Do all buds bloom at the same time?
7. When do buds start to form on the plants?

(Discuss when buds form and what kind of conditions are necessary for the bud to bloom.)

Take a trip to an area where there is an abundance of different kinds of shrubs and trees. Collect samples of branches to experiment with. Try to gather a variety of branches: Spirea, apple tree, chinese elm, cottonwood, oak, honeysuckle, etc.

(A word of warning: Before asking students to bring in branches, be sure they ask the owners' permission to cut them.)

After a short discussion about the branches, you are ready to begin. Soak branches in lukewarm water for ten minutes before putting the cut ends into a pail or large container of water at room temperature. Cover with a large plastic bag (lightweight) to conserve moisture. Fasten cover to sides of the container with tape or string. - OR - Tie a knot in one end of a large plastic cleaner bag. Soak a cloth in ammonia and drop it into the bag. Put the budding branch in the bag and tie the other end. After thirty minutes, take the branch out and place it in a container of warm water and keep it at room temperature - but out of direct sunlight - until the buds burst into bloom. Some buds are regulated by the day length - the ratio of lightness to darkness in a day. This is a protective measure for the plant so they won't bud during a warm spell in January or February and then freeze.

KNOT WATCH

OBJECTIVES:

1. To demonstrate the concept that plants and animals depend on each other.
2. To demonstrate the idea that the environment is in a continuous cycle of death and rebirth in new life.
3. To demonstrate that things happen to trees which harm them, but the overall effect is both bad and good for man and animals as a result of the damage.

MATERIALS:

Bags and jars for collecting bugs, moss, fungi, etc.
screwdriver or jack knife for probing the knots.

BACKGROUND:

Knots are sort of blah things; nobody really cares much about them, or knows much about them. But they are there and surprisingly they have a very important role in nature.

Knots are generally formed in two ways: Most knots are the results of branches dying naturally as the tree grows. The lower limbs are shaded out and seek to have an important function for the tree. The tree responds by self pruning. The branch dies and the growing part of the tree grows around and eventually completely or partially covers up the scar the branch leaves. This type of knot may not be visible on a living tree, but will show up as a beautiful blemish on boards cut from the tree. These knots are very important to man for we judge the beauty of some woods on color, shape and number of knots which are present. We value knotty pine for decoration on walls, knots in walnut, oak and maple for some types of furniture and gunstocks. These types of knots are pretty but they weaken the structural strength of the boards. So, if you are building a house, it is not good to use knotty boards. When you build table tops or cover walls it is fine.

Knots also form around scars on trees which are caused by wind damage, animal damage or other kinds of mechanical damage. When we get cut we bleed, get a scab and eventually a scar forms. The same things happen in trees. Sometimes the scar is too big for the tree to repair and the cut stays open. Then beetles drill holes into the dead heartwood of the tree, then fungi and ants follow. Then woodpeckers drill holes in the knot to get the bugs or to make a nest. After the woodpecker leaves, a squirrel, mouse or a bat will use the hole as a home while the tree continues to grow around the knot. As the tree is growing on the outside and above, it is dying and rotting on the inside. The process of recycling the nutrients tied up in the dead wood goes on while living wood is being made.

The whole process is quite interesting.

ACTIVITY:

Ask questions about trees and how they grow, live and die.

1. How are trees used by animals and other plants? List the ways.
2. What are knots? How are they made? Are they good or bad? What does that depend on? How are they used? Let's study them.

Select teams to do different knot projects:

Art: Draw or photograph different types of knots. Draw or photograph different ways plants and animals use knots.

Science: Collect the bugs, moss, mold, toadstools, animal signs in and around knots. What life depends on knots? List them. Which kinds of trees have the most knots?

Social Studies: How are knots important to us? Get a knotty board and a knot free board. Do an experiment to see which breaks easiest. Which is the prettiest? Vote on it.

Take a walk around the school, a park or anywhere there are mature trees. Have the students select trees and count the knots they can see. Have them record the animals and plants they find in the knots and collect them. Have them record the shape and size of the hole in the knot. Have them determine what caused the knot.

Collect the data and record it. Which kind of tree averages the most knots; the biggest and smallest knots? Which tree has the best knots for woodpeckers and squirrels? What do the knot shapes remind the students of? Draw in detail the favorite knot shape and have the students use it as the mouth of a face or an old person, or a monster.

What is the cause of most knots? What effect does the knot have on the tree? What does it to do the tree?

STUDYING LEAVES

OBJECTIVES:

1. To promote student awareness of the vast variety of leaves.
2. To help students discover that leaves have different forms and shapes.

MATERIALS:

paper bags

BACKGROUND:

Much too often we miss the true perfection and character of a leaf because of the vast number of leaves. Try considering a few leaves by themselves.

Many things can be considered in a study of leaves. Notice the shape of the leaves. Do all leaves look and feel the same? What do leaves smell like? How do leaves grow on a branch?

ACTIVITY:

1. What are leaves?
2. What do they do?
3. What color are they?
4. Are leaves all the same color?
5. Do some leaves stay green?
6. Why do some trees lose all their leaves?
7. Do evergreen trees lose their leaves?

Give each student a bag for collecting leaves. Then allow the students to explore trees. Give the students a few examples of leaves to look for, such as 2 green leaves, 3 yellow leaves, 1 triangle shaped leaf and 1 leaf that is more than one color. Also, let them discover other things. Have them look for large and small leaves. See if they can find an unusual leaf, something maybe nobody else noticed.

Discuss the leaves. Lead the students to observations such as: Are leaves the same color? Are all leaves the same shape? Are all leaves the same size? Do trees usually grow the same color, size and shape of leaves?

Have the students use some of their leaves as an art project. Make leaf characters. Children can make birds, animals, people--almost anything. Use the leaf as the main part of the character and with paints and colors, add interesting highlights. Or, draw a picture and add leaves for focal points.

OBJECTIVES:

1. To acquaint students with plants common to their environment.
2. To acquaint students with the different plant parts.

MATERIALS:

plants

BACKGROUND:

Every day plants play a demanding role in our lives. Plants come in many sizes and forms. Plants are used for a variety of different things. But one thing all plants have in common are their parts. All green plants have roots, stems, leaves, seeds and almost all of them have some kind of flower. This activity or game has one objective: identifying plant parts. After playing the game, the student will be able to identify the parts of a plant.

ACTIVITY:

1. Can you name the parts of a plant?
2. Where is the flower?
3. Where are the leaves?
4. What is the center or main branch called?
5. What part of the plant grows in the soil?

Any area where there is an abundance of small plants is an excellent spot for a trip. With the students, study the plants. Look for visible evidence of plant parts. Study large plants as well as the small plants. Examine the different parts of the plants. How are they important? What is their function, etc.? Have each student gather two or three plants of their choice, being sure that the plants they choose have roots, stems, leaves, and, if possible, a flower.

Take the plants back to the classroom. Study and identify the plant and its parts. Then have each child take one plant and cut it apart to make a puzzle. Cut off the roots, the leaves, the buds, and the flowers. Take out any seeds and you should have just a stem left. Then, with all the parts in front of you, put the plant back just as if it were a puzzle. Have the students exchange plant puzzles with other members of the class.

OR:

Try "Touch and Tell" with the parts of a plant. Put a plant part in a box, but don't let the children see which part. Choose one student to come up and feel what is in the box. By feeling, he should be able to tell what part it is.

ADOPT A TREE

OBJECTIVES:

1. To develop the habit of accurate observation of our environment.
2. To develop an appreciation of trees and the changes they go through as the seasons change.

MATERIALS:

paper
crayons
tree

BACKGROUND:

Everything in our environment undergoes a cycle of change. These changes are constantly taking place in different stages. Some of these changes are noticeable while others go on almost unnoticed. It is important that students realize that the world they live in is changing, and why it is. A tree is a good example of a change that is relatively easy to see. So let's adopt a tree and follow it through some of its changes.

ACTIVITY:

1. Name some things you know change in the way they look.
2. When do these changes take place?
3. Does everything change at the same time?
4. Why do you think things change?

Since trees assume their most dramatic changes in the fall, a good time to begin this unit would be shortly after school starts. After a brief introduction of changes in our environment, discuss the purpose of adopting a tree with the class.

1. Adopt a tree. Choose a tree that can easily be observed. The tree should be close to the school, so that it can be visited as often as the students want to. It's nice if the students can see the tree from the classroom, too.

2. Record the changes as they take place. This can be done in various ways; an easy way for younger children is to draw the changes. Each child can make a picture file on the tree. As dramatic changes occur, observe the tree closely, record the information, date it and place it in the file. Students will soon become aware of the changes in their own. In the fall, watch for change of color and leaves falling. In the winter, watch for change of color and leaves falling. In the winter, observe the tree getting ready for spring. The typical leaf is born inside a bud in the winter. In the spring, watch for the leaves and other signs of spring. Carefully watch, for next the tree will be dressed in her summer dress.

3. At the end of the school year each child should have 10-15 pictures in his file. Each picture will depict a different stage of change. Talk about the changes that took place.

HOW A PLANT DRINKS

OBJECTIVE:

1. To introduce the concept of how food and water is transported through the plant.

MATERIALS:

carrot
celery
glasses
food coloring

BACKGROUND:

After a study on the purpose of roots and stems and how a root and stem works, introduce the concept of how the food and water is transported throughout the plant. Xylem is a part of the plant that carries food and water upward through the plant.. Xylem carries food and water up from the root through the stem to the leaves, buds and flowers. A simple experiment with a carrot, a stalk of celery and colored water will show the students how this process works.

ACTIVITY:

1. Do you know how plants receive their water and food?
2. How does the flower get its food and water?
3. How does the leaf get its food and water?

Begin with the carrot experiment. Ask your students: How does water go from the soil into a plant? After a short discussion, color some water with green ink and put a carrot into it. A few hours later, cut the carrot. What happened?

A simple way to demonstrate how water goes up a plant is with colored water and celery. Note the small tubes in the celery stalk. Show the students the small tubes. Split the celery stalk part way up. Put one part of the celery in a glass of green water and the other part in a glass of red water. In a matter of a few minutes, the small tubes will change colors. What has happened? Make observations.

MAKING A TERRARIUM

MATERIALS:

glass box
or/ 5 pieces of glass, cookie sheet, tape
plaster of paris
soil
one pint of gravel
one pint of sand
one pint of vermiculite
powdered charcoal
1 small lid
plants
one small animal, such as a toad or a similar animal

ACTIVITY:

Explain to the students that a terrarium is a created environment, where plants and animals live together. By having a terrarium in the classroom the children can see how the plants and animals grow and discover how each relies upon the other.

PROCEDURE:

If a glass box is not available, you can improvise with 5 pieces of glass, a cookie sheet, and tape.

1. Tape four pieces of glass together:
2. Make a thin paste mixture of plaster of paris in the cookie sheet. Then carefully set the glass frame into cookie sheet. When plaster is hard, the terrarium is ready for preparation.
3. Place about one pint of gravel on the bottom of the terrarium. On top of this pour about one pint of sand.
4. Mix the soil, vermiculite and charcoal together and pour this over the sand and gravel.
5. Push the jar lid, or pie pan, filled with water, into the soil, (this will be like a small pond in the terrarium). Place a small piece of wood near the water.
6. Now place plants in a careful arrangement. Moss, fern, violet, and creeping snowberries are good plants to use. All of the plants, although different, will be able to live together.
7. Add a small toad, frog, salamander, snails, turtle, or insects, if desired. The plants are similar to their natural surroundings, and there is a place for them to hide and a pond for them. One small animal is plenty in a small terrarium.

OBSERVATIONS:

Watch the terrarium each day. Record some of the things that are happening.

1. Are the plants turning away or towards the sun?
2. What is happening to the water in the pond?
3. Is there water on the glass cover of the terrarium? Why?
4. What does the animal eat?
5. Does he have teeth?
6. How does he catch his food?

The life cycle of the toad could also be studied, (toads, eggs, tadpoles.) How do toads breathe when they are small and when they are adults?

HOW DO SEEDS TRAVEL?

OBJECTIVES:

1. To introduce some of the primary methods of seed dispersal to elementary students.
2. To show plant dependence on animals.

BACKGROUND:

We are familiar with methods of dispersal among animals because we have had more experience working with them. The students may be very interested in this subject because they probably haven't had much experience with plants and seeds. Just the idea that seeds are able to travel miles without any power of their own is intriguing.

ACTIVITY:

Ask these questions:

1. Do you think that birds have any trouble moving from one grove of trees to another?
2. How does a deer move from one area to another?
3. How about a seed? How do they move? Can they run or fly?
4. What happens when a seed gets ready to move to a new home?
5. How do we know that seeds move? (They must be able to move to a new area because plants spread -- they don't always stay in the same field.)

Take the students to a weedy area and let them walk around and collect seeds. Find weeds such as milkweed or cattails that have a fluffy seed. Show them that the wind will transport light seeds very easily and very well. Check their clothes to see if they have any burs and other weed seeds attached to them. Ask them if that might be a method for seeds to move. The third method of seed dispersal may be a little more difficult to find, but it will be in the area if one looks closely. When birds or animals eat fruits and berries, the seeds will not all be digested. Their manure will contain undigested seeds. Have the students collect samples of the different ways seeds move.

Discuss methods in which seeds move. Have the students write short stories of make believe such as "if I were a seed I would ---" etc. Also, the students might be allowed to collect various types of seeds to be used in creating a seed picture of some kind.

Plant examples of the different seeds that the students have collected. Keep some of the samples, put them in the school deep freeze for a month and plant them. Chances are that some of the burs and seeds which didn't grow earlier will grow now!!

The story of Johnny Appleseed might be read and discussed.

APPENDIX C

Weather

RAIN

OBJECTIVES:

1. To help students understand the "mystery" of rain.
2. To study the importance of rain and the rain cycle.
3. To measure the amount and size of rain.

MATERIALS:

Flour Pan Jar Sifter

BACKGROUND:

To young children rain is a mystery--something that falls from the sky and stops their play. This activity is designed to help students understand rain. It introduces basic concepts of rain and includes simple experiments to measure the size of raindrops.

ACTIVITY:

Discuss rain. What is rain? Where does it come from? How does it get there? What are good aspects of rain?--bad ones? Name some forms of rain. What does rain sound like? How does rain feel? How does rain fall? What is rain good for? What kinds of clouds bring rain? Are all raindrops the same size? What happens when it rains?

On a rainy day, go outside and observe the different things about rain.

Listen to the rain--describe it.
Feel the rain--describe it.
What color is rain?
What happens to the trees, plants, grass, etc. when it rains?
Do they get washed off like we do when we take a shower or bath?
How does the rain help the trees, plants and other things?
How does rain come down? In what form? (drops)
Are all raindrops alike?

The following is a simple experiment in which students may measure the size of raindrops:

Put flour on the bottom of a pan and hold it out in the rain, making certain several drops fall on the flour. Bring the pan indoors and let it set for one-half hour. Sift the flour. The remains in the sifter represent the raindrop sizes.

Measure how much it rained by putting a can outside to catch the rain. Put the rain water in a covered jar. Do this several days and measure the different amounts of rain.

Test to see what type of clothing is best to wear in the rain, with several articles and sprinkling bottle. Pretend its raining. Which articles of clothing does the rain penetrate? Which ones stay dry?

WIND

OBJECTIVES:

1. To acquaint students with good and bad characteristics of wind.
2. To develop in students an awareness of what causes wind.

MATERIALS:

5-6 helium ballons
5-6 self-addressed postcards with directions for returning the information

ACTIVITY:

Talk to the students about the wind and weather. Ask them questions similar to the following:

1. What is air?
2. Can you taste it?
3. Can you feel it?
4. Can you see it?
5. Is air heavy?
6. Can you see it?
7. When is air "hard?"
8. When is air heaviest?
9. What is wind? What does it have to do with air?
10. How is wind like running water?
11. How is wind good to us? List the ways.
12. How is wind harmful to us? LIst the ways.
13. How is wind affected by other things?
14. Does a shelterbelt slow down wind? How?
15. Do buildings slow the wind down? How?
16. Is the wind speed the same on all sides of the school house on a windy day?
17. How do we know that the wind blows?
18. What causes the wind to blow?
19. How can we tell wind direction?
20. How do we measure wind speed?
21. Why is it important to know about wind speed?
22. What is wind chill?
23. How can we find out what the wind chill temperature is?
24. Is the wind chill the same on all sides of the building?
25. What does man do to modify the effects of the wind?
26. Does man's modification of the wind benefit anyone besides him?

Suggest a field trip to study wind. Is the wind speed the same on the ground as it is in the air? Why or why not?

It might be interesting for the students to send up a helium filled balloon (these can be fixed up with baggies tied on with postcards containing a name, address, purpose, etc.). Have the students release the balloons with the possibility of getting some of them back by people who find them.

Have the students ever heard of a helium balloon? Would you like to send a couple of them up? How can we find out where they go? Let's send postcards along so if someone finds the balloon, they can send it back. How far do you think the balloon will travel?

In addition, the students might guess which direction and how far he thinks his balloon will travel with the aid of a map of Kansas.

WHICH IS COLDER, ICE OR SNOW?

OBJECTIVES:

1. To introduce the students to a scientific, problem-solving method.
2. To emphasize the ability of snow to insulate and introduce some important properties of ice and snow.
3. To introduce the concept of temperature affecting the speed of chemical reactions.

MATERIALS:

A hammer or hatchet for chipping ice
Two ice cream freezers - hand crank or electric - both of one type
Ice chips - enough to make one gallon of ice cream
Snow - enough to make one gallon of ice cream
Ice cream salt, livestock salt, or canning and pickling salt (be sure to have enough for both freezers out of the same salt source)
Two plastic or paper cups to measure the amount of salt
Spoons and dishes enough for the class and teacher
Two thermometers
Recipe for one gallon of ice cream (you will need to double the recipe below)

ICE CREAM

4 eggs
2 1/2 cups sugar
6 cups milk
4 cups cream or half and half
2 tablespoons vanilla
1/2 teaspoon salt

Beat eggs until light. Add sugar gradually. Add remaining ingredients and mix well with beater. Freeze.

Have the mixture put together by the kids or cooks or bring prepared to school by a volunteer mother. Remember to use identical ingredients for both freezers.

BACKGROUND:

Don't let the objectives listed above throw you. All of these things can be done without much preparation or prior knowledge. These concepts are done using two hand crank (or electric) ice cream freezers. As long as the freezers contain the same capacity and both are hand crank, or both electric, they will work. Borrow them from parents and/or anyone in the community. Set up an experiemt like one of those suggested. Put the ingredients together, put the kids to cranking and counting the number of cranks it takes until ice cream is finished. A scientific experiment will have taken place and will be ready to discuss.

ACTIVITY:

Introduce this project as one in which the children conduct a real, genuine experiment to answer the following question: Which is colder, ice or snow? Record the students' responses on the board. Then, ask them how they would conduct an experiment which would enable them to find out. Explore why they think ice is colder than snow or snow colder than ice. Or, why they are the same. Help them to suggest ways they might test snow and ice to answer their questions. If no one comes up with it, suggest using ice cream freezers to freeze ice cream to determine which freezes ice cream the fastest. Ask them how they would put the test together to insure that it would be valid.

You set the experiment so that everything is the same, but the variable you wish to measure. In this case, do the following:

Have two ice cream freezers of the same type and capacity. Use exactly the same ingredients for each freezer. When you pour the ice cream mixture into the container, note how much room is taken up and how much is left in the container. Put snow in one and chipped ice in the other; use exactly the same number of cups of freezing salt of the same brand in each. Record the time you start turning the handle and the time the ice cream is finished to have a definite record of the time it took. Also, have the kids record the number of times they turned the crank; this will give you another measure of the difference. As the students are turning the crank, carefully take the temperature of the ice-salt mixture and the snow-salt mixture and record them every five minutes. Be sure that the same amount of salt is used and add ice and snow as needed. When the ice cream is finished in the container, pull out the paddles and scrape them. Note how full the containers are. (Save the questions for later). Pack the ice cream and let it sit, or dish it out and eat it.

Activities can be done inside or outside. You may want to have the children collect the ice prior to the activity by filling milk cartons with water and setting them outside to freeze. Arrange to give each child a turn at the freezer crank. Have a contest to see which boy or girl can make the most turns in one minute. Assign jobs: turners, snow, ice, and salt handlers, temperature takers, paddle cleaners, servers, etc. so that everyone gets into the act. This activity may follow another winter field trip or may be the central theme of one.

List the results of this experiment on the board:

ICE CREAM FREEZER NUMBER ONE	ICE CREAM FREEZER NUMBER TWO
Time Started: _____	Time Started: _____
Time Finished: _____	Time Finished: _____
# of Cranks: _____	# of Cranks: _____
Temp. outside at study site _____	Temp. outside at study site _____
Temp. at Start --	Temp. at Start --
Freezing Fluid _____	Freezing Fluid _____
at 5 min. _____	at 5 min. _____
at 10 min. _____	at 10 min. _____
at 15 min. _____	at 15 min. _____
at Finish _____	at Finish _____
Amount in freezer at start _____	Amount in freezer at start _____
Amount in freezer at end _____	Amount in freezer at end _____

Which mixture froze the ice cream fastest? Why?
Which mixture was the coldest temperature? Why?
How long did it take to freeze each container? How many minutes difference?
How many cranks did it take to freeze each container?
Who could turn the most cranks in one minute? A boy or a girl?
Did the temperature change in the freezing mixtures? Why or why not?
Were the ice cream containers more full at the end than when you started? Why?
Why did you use salt in the freezing mixture?
Do you suppose that ice cream would freeze faster?

--outside than inside?
--on a warm day than on a cold day?
--if you didn't use salt with the snow or ice?
--if you took it out on a very cold day and used no snow or ice?
--if you used just air?

Would it make a difference in the time it took to freeze it if we used a different recipe or put chocolate or strawberries in the mixture? You may want to set up additional experiments to try to answer the previously asked questions.

MAKING SNOWDRIFTS

OBJECTIVES:

1. To acquaint students with the relationship of wind and wind action on snow distribution.
2. To acquaint students with the concept that obstructions or objects slowing down wind and changing direction of wind, result in the creation of different shapes of snowdrifts.
3. To introduce the concept of experimental design and standardization.

MATERIALS:

A variety of different shaped objects: balls, toys, cans, boxes, etc.
A measuring tape (50-100 ft.) or string

ACTIVITY:

Ask questions and effect partial answers; leave open ends which will be answered by the students. The following is a series of questions which may be useful:

1. What is snow?
2. What does it feel like?
3. What color is it?
4. Is it hard or soft, warm or cold?
5. Does it taste good?
6. Where does it come from?
7. What is snow made from?
8. What happens to snow after it falls? Does it always stay where it it falls? What happens to it? Where does it go?
9. What are snow piles called? What makes up a snow pile?
10. There are three things which are needed to make a snowdrift. List them. (snow, wind, and some object)
11. Are there different shapes of drifts? Why are they different shapes?
12. Are they all deep? Long? Wide?
13. Do men purposely make snowdrifts? Yes, snow fences along highways. Do not attempt to get definitive answers from the students. Leave things up in the air.

Suggest doing an experiment finding out about these things. Ask each child to bring some item from home for the experiment--preferably one which will not need to be returned in case it is lost or misplaced outside. The bigger the object, the greater the chance for a good snowdrift.

1. Instruct the children to dress warmly.
2. The activity takes 15-20 minutes at a maximum and can be done at any temperature or under any weather conditions.
3. Have two boys or girls mark off a 50-100 ft. line. Have them prop up the objects at 3-5 foot intervals along the straight line. (The objects should be propped up to provide maximum surface to the wind).
4. Return to the classroom. Instruct the students to leave the objects and area around the objects undisturbed to let nature do its work.

POST-ACTIVITY:

Wait for snow and wind; allow for drifting to occur. When this has occurred, prepare for another outdoor activity by asking the children the following questions:

1. Who had the longest drift? Why was his longer than anyone else's? (The length of a drift is that point where the snow levels out and maintains a consistent depth.) The depth can be measured by sticking a yardstick straight down into the snow (no. 1 end down) until it hits the ground. The number at this point which is level with the surface of the snow is the depth of the snow at that point. The length of the drift will depend upon the height of the obstruction, how directly it faced the wind, and its shape.

2. Who had the widest drift? Why was his widest?

3. Did anyone cause the wind to dig a hole in the snow? Rounded objects will cause the wind to whip the snow out creating a hole.

4. Who had the deepest drift? This will depend on not only the height of the barrier, but also on how directly it faces the prevailing winds.

5. Who had the tiniest drift?

6. What happens when the wind blows snow around something with no corners? The children may answer this by using round objects such as basketballs, tires, etc.

7. What happened when the wind bl w snow around a cube shaped object? Someone may have shoved the open end of a cardboard box into the snow and observed the drifts that developed around it.

You might want to serve as a judge and have a contest among the children to find:

1. Who can create the longest drift?
2. Who can create the widest drfit?
3. Who can cause the wind to dig the deepest hole in the snow?
4. Who can create the deepest drift?
5. Who can create the tiniest drift?
6. Who can create the greatest number of different kinds of drifts using the same object? Try a shoe box.
7. Who can create the oddest shaped drift? A very asymmetrical object like a toy doll might be best.

Summarize the preceeding questions and tabulate the results on the blackboard.

Who had the longer drift? How long? What object made it?

Who had the oddest shaped drift? What shape? What object was used?

Who had the widest drift? What object was used? How wide?

Who had the deepest drift? How deep? What object was used?

Discuss drifts and how they are important ot us.

A. Problems - plug our roads

B. Provide places for wildlife to live in the winter

C. Store up moisture for spring

D. Protect ground from the cold and wind

E. Fun to play in and on

TIPS: Place the object out in a very open field and check after each windy day and storm. If any kind of drifts are present, finish it up.

Weight boxes and light objects down with snow or dirt clods.

Do not set up this experiment on the ice of a lake.
We have not had what you could call an outstanding success with this experiment, but it is fun and you accomplish the objectives whether or not you get drifts.

CLUES TO LIFE IN THE SNOW

OBJECTIVES:

To acquaint the student with winter birds, mammals, and insects.

MATERIALS:

1. jars
2. magnifiers for studying clues
3. notebook and pencil
4. a research guide on animal tracks

BACKGROUND:

Students are particularly interested in living creatures and all of them will be excited about hunting animals and birds during the class time. In the winter, winter birds and animals are hard to find in any variety, particularly with 15-30 noisy children looking for them. The answer then is to hunt for clues like a detective or wildlife biologist. Clues left by wildlife are very important to the management of our hunted wildlife. Tracks give us an indication of the species, locations and home ranges, habitat preferences, numbers and even sexes of the birds or animals making them. Manure will give us an indication of the numbers, sizes, food habits, and species of birds and animals. Songs and flight patterns help us to identify species of birds. Nests tell us something of the sizes, species and habitat preferences of the birds. Holes in trees, snow and soils give indications as to habitats and species. Feathers, fur and body parts are also indicators of age, sex and species of birds and mammals. There are lots of clues to life everywhere around us. Bark of trees will show the signs of woodpecker, squirrel and insect work. Children will find a remarkable variety of clues, if properly prepared and with a little guidance from you.

ACTIVITY:

Introduce the students to clues to life in the snow by asking them questions. Make a list of their answers.

1. How many kinds of birds have you seen this winter?
2. Which ones stay around all winter?
3. How many kinds of mammals stay around all winter?
4. How many have you seen?
5. Now let's think of kinds of clues they leave around in the winter.
6. How many bugs have you seen? (flies, box elder bugs in the house, etc.)
7. Can you think of clues we might find?

Instruct the students to bring paper bags or jars for a field trip. Mention that a contest will be held, prizes for most bird clues, most animal clues and total clues, most unusual clues, etc.

Arrange to have a mother or two take a group. Split up to search different areas; one group in a residential area, one in a marsh, one in a field and one in the woods. Adjust the number of groups to the number of students, supervisors or habitats. Have each group search a different habitat area. Have clues to be studied in the classroom.

Any weather will be fine; just adjust the time outside to the wind chill and temperature. Time 20-60 minutes.

1. Study the clues, compare and talk about them.
2. Have students make lists of birds, animals and insects they saw.
3. Have students make lists of clues to birds, animals, and insects they found.
4. Collect these lists and grade them for the contest winners.
5. Construct a chart which records types of birds and animals and clues found in each habitat type. See sample charts attached.
6. Discuss the differences between habitat types and animal and bird use.
7. Discuss the importance of signs in the snow to hunters, trappers, and farmers.
8. Discuss nuisance animals (what kind killed a sheep or chickens?)
9. Discuss the discovery of what birds and animals are eating so that we can provide food and cover plants for them.
10. Is it necessary for man to trap, hunt, and kill some animals and birds?

KINDS OF SNOW

OBJECTIVES:

1. To acquaint students with the different shapes, sizes textures and water contents of snow of different age classes.
2. To introduce temperature concepts and use of a thermometer.

MATERIALS:

1. thermometer - 20°-100°F
2. quart jars for collecting snow samples
3. magnifying glass
4. a shovel

ACTIVITY:

Prepare the students for the outing with questions. Propose experimenting to find the answers.

Review questions on what snow is, where it comes from, what happens to it, etc.

Does snow get old? What happens if it gets old?

Does snow change shape? What is the difference in shape between snow that is old and that which is new? What causes the change?

Do you know where to find different kinds of snow? List the places.

A snowdrift will normally have layers from different snows or windy days. Each layer should yield snow at a different stage, shape and water content.

Split the class into groups; have each group find and collect one type of snow in a quart jar. Pass out thermometers and practice using them. Explain temperatures and how we use them.

1. Take the children into the school neighborhood and look for different textures and ages of snow.
2. Have them feel the snow crystals from different layers. Have them taste and feel the texture of the snow with their tongue.
3. Have each group collect one age of snow.
4. Look at crystals with magnifiers of each snow type.
5. The activity will not take more than 15 minutes or can be extended to a 45 minute session or an hour if the weather permits.

Return to the classroom and do some of the following activities which are suitable to your grade level.

Which melts faster: an ice cube or a snowball? (Each of which weighs the same) How much water, at different temperatures, does it take to melt a cup of snow? (Water at 40°F will melt only 5.5% of its weight in snow; at 60°F only 20%).

How many cups of snow are needed to make one cup of water? Snow will be fluffy and least packed on the top of an accumulated layer on the ground. Fresh fallen snow has a lot of air between the crystals. Ten cups may be needed to make a cup of water. Snow found within the accumulated layer will be packed by both the weight of the snow above and by the recrystalization into more dense particles. It may take only three to five cups of the denser snow near the ground to melt to a cup of water.

Will a foot of new fallen snow be equal to a foot in depth one week later? Drifted snow will contain broken crystals of new fallen snow and although it is made up of very fine particles it may become densely packed as these little fragments of crystals can fit tightly together. Test drifted snow for density by seeing how many cups of snow it takes to make a cup of water. When snow crystals become tightly packed together and then evaporate and recrystalize they can become frozen together where they touch each other. We can say that this snow is cemented together. It holds together well enough to be cut into blocks with a shovel or blade. Snow blocks are handy to use for building snow houses, forts, and windbreaks. Unfortunately, cemented snow is not always easy to find.

When snow begins to melt it does not drip and run like an ice cube. The porous nature of snow allows the water to be soaked between the crystals as in a blotter. A good guessing game can be provided by sticking a snowball on a pencil (in a heated room) and making students guess how long it will be before the first drop of water falls off the snowball. It may take as long as one hour.

What temperature is the snow when you bring it into class and it starts to melt? When it is half melted? When it has all melted? Why do you suppose it is always about the same temperature?

Where does the air in the jar come from? You filled the jar with snow.
Which type of snow melts to give the most water?
Which type of snow melts to give the least amount of water?
Draw the crystals of different aged snow.
Describe how the different snow feels in the hand.
Describe how the different snow feels in the mouth.

Have the students take temperatures of the snow in their jars. Snow can be helped to melt by submerging the jar under warm water until the glass is warm, then taken out of the water and shaken. This must be done carefully for water too hot and applied too fast may cause the jar to break.

The students should learn that snow of different ages does have different texture and water content. He will learn that ice melts faster than snow with a given weight. Snow soaks up water and shrinks. It takes much heat and time to melt snow. Snow from the time it starts to melt until the last snow melts remains at 32°F or 0°C.

Make a chart to show the different water yeilds of one gallon pail of snow or ice. (See following example)

KIND OF SNOW	CUPS OF WATER
NEW SNOW	FOUR CUPS
CRUSTY LAYER	SIX CUPS
THIRD LAYER	SEVEN CUPS
FOURTH LAYER	EIGHT CUPS
JUST ABOVE GROUND	EIGHT AND ONE-HALF CUPS
SNOW MOBILE PACKED SNOW	TEN CUPS
CHIPPED ICE	FIFTEEN CUPS

NOTE: The above are simply guesses.

THE ICE CUBE GAME

OBJECTIVES:

To study the properties of ice.

MATERIALS:

Ice cubes
Paper towels

BACKGROUND:

Who can melt the ice cube the fastest? Who can make theirs last the longest? (Anything goes). These games can be used to introduce a unit on ice or winter, or just in a lesson by itself. The main point is to get children to realize a need to collect information. The student with the most relevant information should win the game. This information may have been picked up through past experience, or it may be picked up from the game. Do not give the students any clues, let them go on their own. After this is finished, put an ice cube on a paper plate and a snowball on another. Have them guess which will melt fastest.

ACTIVITY:

What happens to water when it gets real cold?
What is ice?
How does it feel?
What happens to ice when it is allowed to get warm?
Which melts fastest, an ice cube or a snowball?

1. Children are always amazed at the actual process of water changing to ice. As a winter activity have the children make the ice cubes. Set an ice cube tray full of water on a window sill. Let the children take turns checking to see if it is ice. When it has turned to ice, then proceed to play the game.
2. Ask: Who can get their ice cube to melt the fastest?
3. Play the game. (Students may want to play it more than once.)
4. As a class, talk about the collected information.
5. Try the reverse game of preserving an ice cube as long as possible.
6. Try ice and snow.

A STUDY OF OUTDOOR TEMPERATURES

OBJECTIVES:

1. To develop an awareness of temperature change and variations in different locations.
2. To encourage children to discover why the temperature changes and why the temperature is different in different locations.
3. To acquaint students with the thermometer and the uses of graphs in showing the differences in the different locations, at different times of the day, and also during different seasons.

MATERIALS:

Thermometer
Pencils
Paper

BACKGROUND:

The sun gives off light and [illegible] energy. All life on earth depends on this energy from the sun. At certain times of the year different parts of the earth get more direct energy from the sun than they do at other times, causing different seasons and different climates. Wind and humidity affect temperatures. Land is heated faster than water and affects the weather.

ACTIVITY:

Discuss where there might be differences in temperatures.

In an open unsheltered area.
Ten feet up in the air.
Close to the ground.
Under the grass.
In a sheltered area out of the wind.
In the shade.
In a puddle or a pail of water.
In the sand or dirt.
On a sidewalk.

Where would you expect to find the warmest temperatures?
Which will heat more quickly, sand or water? Which cools quicker?

Divide into five or six groups to cover each location to be studied. This could be done on a clear day, a windy day and again on a cloudy day to show variations and differences. It may be repeated again during different seasons for comparison and study.

Have each group take temperatures and record the the data three or four times during the day and put the information on a graph. Notes should be kept as to wind direction; whether it was cloudy or bright.

Record the temperatures of each group on the chalkboard or on a large chart for discussion and comparison. Record the differences at the different times and compare. Discuss changes if any and why they are different. Compare graphs to show the differences in the different locations and discuss why they are different.

WHAT HAPPENS ON A WINDY DAY?

OBJECTIVES:

1. To acquaint students with the characteristics of wind.
2. To acquaint students with what causes wind.
3. To acquaint students with the effects of wind on our environment.

BACKGROUND:

Wind is air that moves rapidly. It is formed when air close to the ground becomes warm. It then rises and cold air from above takes its place. Differences in temperature cause various kinds of air movement. These air movements can cause storms. Changes in wind conditions make changes in weather.

ACTIVITY:

What is wind?	Can you see it?
What causes wind?	What is a small wind called?
Can you taste it?	How is the wind good to us?
Can you feel it?	How is the wind harmful to us?

This activity can be done in the school yard. Outdoor activities can include some, or all, of the following:

1. Ask pupils to follow simple directions such as walking or pointing in the direction of the wind as indicated by tree branches, grass or anything else.
2. Observe: the evaporation of water in a water puddle on windy day. Trees in the wind; the flag.
3. Listen to the sounds of the wind. Sometimes it howls; other times it whistles. Does it make other sounds? Can you always hear the wind?
4. How does the wind feel when you run against it? Run away from it? Stand still? Is it harder to open a door when the wind is blowing than when there is no wind? Why?
5. Let the pupils sway their bodies as the wind blows. Have the students dramatize the wind, by observing the trees, grass, leaves, etc.
6. Look for the good effects of the wind; such as seed dispersal, cloud movement, evaporation, windmills, kite flying.
7. Look for the bad effects of the wind. Such as soil erosion, etc.

Back in the classroom have the students describe the sounds they heard. How the wind felt. List the observations they noticed, what the wind was doing and the good and bad effects of the wind.

For a music follow up, let the pupils sway their arms or bodies to piano or record rhythms. Play a "running" tune as the children "run in the wind." Create rhythm exercises where the children use scarves or crepe paper streamers.

For an art follow up try "Huff and Puff Designs." Give each child a piece of paper with a blob of paint on it. Then give each child a drinking straw and, without touching the paint, blow it around the paper in any design that he likes. The first attempt is likely to look like a tree or a plant. Smaller blobs of brighter colors can be blown around to look like flowers. As the child learns how to handle the straw and paint, the designs will become more original. This activity is an excellent way to introduce the secondary colors by blending two or more colors together.

APPENDIX D

Miscellaneous Activities

MAKING MICROSCOPIC SLIDES

EQUIPMENT:

1. One glass slide per student
2. One cover slip (tiny cover glass) per student
3. One eye dropper per every two students
4. Supply of methyl cellulose - a chemical for slowing animals down (optional)
5. Water sample, dirt, insects, sand, hair, etc. (any sample collected)
6. A supply of Turtox CMC-10 Mounting Media (optional)
7. Microscopes - 4-43 power - any magnifier will do

ACTIVITY:

Explain that the students will be making preparations for looking at tiny things under a microscope. We will make slide preparations of different things. Each of them can make a slide of their own (or many if desired) and look at it under a microscope or magnifying glass.

Demonstrate the technique of making a good slide preparation to the students. Diagram it on the blackboard.

1. Step one, select a clean glass slide and cover slip.
2. Take an eye dropper and place one drop of water or mounting media on the center of the slide.
3. If the specimen is not in the water, then place it in the media or water drop.
4. Place the cover slip on the glass slide at an angle and move it until the bottom edge touches the water or media drop. Then carefully lower the cover glass to the drop.
5. The slide should then be labeled with a grease pencil, crayon, or masking tape. It is then ready for view under the microscope.
6. If a mounting media is used, the slides should be viewed immediately, and then allowed to dry overnight and viewed again the next day.
7. Store slides separately and do not stack them. They will stick together and are difficult to separate.

Temporary mounts made with water are best for younger children. They can wash and re-use the slides and cover slips over and over. It is best if you can arrange for one microscope for every five children if possible. NOTE: Cover slips are very delicate and must be handled very carefully.

For grades K-2, it is best not to use cover slips at all. Wet mounts can be used at lower magnification without distracting from the experiment.

For a follow-up activity, you might have the children draw pictures of the organisms they mounted.

SIMPLIFIED ROCK STUDY

OBJECTIVES:

1. To introduce students to simple methods of rock classification.
2. To assist students in discovering different properties of various kinds of rocks.
3. To acquaint the students with the basic concept that it takes thousands of years for rocks to form and that rocks eventually become soil.
4. To develop aesthetic appreciation for the value of rocks.

MATERIALS:

sack
magnifying glass
pan
water
hammer

BACKGROUND:

Rocks are an interesting topic for study. Even in the lower elementary grades, students can learn to classify rocks in many simple ways. For example, hard-soft, bubbly-non-bubbly, smooth-rough, big-small, like-different, by various colors, dull-sharp, etc.

This is an especially good activity to use at the beginning of the school year since most children have had an association with rocks and are quite familiar with them. In addition, it is very easy to locate an area for a field trip since a good variety of rocks can be found almost anywhere.

ACTIVITY:

Open a discussion on where rocks can be found. Some responses might include:

1. Along a lake or seashore
2. The bottom of a little stream
3. On a gravel road
4. On the school grounds
5. In a gravel pit
6. At home in the backyard

Continue the discussion using the following questions or others that are appropriate:

1. What are rocks?
2. Where do they come from?
3. What's in a rock?
4. Why are some large and some small?
5. Do rocks always stay the same size or do they become larger or smaller?
6. How are rocks alike?
7. How do they differ?
8. Are they dull or sharp?
9. Are they smooth or rough?
10. What colors are they?
11. Why are they different colors?
12. How do they smell?

Give each child a strong sack (preferably not plastic) and take them to a gravel pit or an area where there is a great abundance of rocks. Encourage them to collect many different kinds. Return to the classroom.

Set up areas in the classroom for children to display the rocks they have collected. For example, put the hard rocks together, the smooth, the bubbly, etc.

Allow the children to test rocks for hardness by using a nail or by rubbing rocks together. Use the following to classify them:

1. Very soft rocks can be scratched with a fingernail and often break very easily.
2. Soft rocks can be scratched with the edge of a penny, but these rocks won't scratch a piece of glass.
3. Medium rocks can be scratched with a knife, but the rocks will barely scratch a piece of glass.
4. Hard rocks cannot be scratched with a knife and will scratch a piece of glass.
5. Very hard rocks will scratch a knife and a piece of glass easily.

Rocks can be tested further for hardness by rubbing them against each other and then noticing which one scratches the other.

Allow the students to study the rocks with a magnifying glass. The students may want to break a rock open to examine it further. (Wrap the rocks in a piece of cloth before striking them with the hammer so that chips don't fly all over or perhaps get into your eyes).

Use a piece of ceramic tile for testing color. Test for rock color by rubbing each rock on a piece of tile. Let the students discover which side of the tile works best.

Roll rocks over in a shallow pan of water. The water will make some rocks smell differently. For example, a slate rock will smell like mud. (This kind of activity correlates well with studies of the senses).

Students can classify rocks as bubbly or non-bubbly by dropping them into water or vinegar and watching to see if they bubble or not. Let the students try to dry them after removing them from the water and discover that this is not easily done. Why?

MODIFIED COAL GARDEN

OBJECTIVES:

1. To introduce the students to the beginning concepts of chemical reaction.
2. To encourage students to become interested in and curious as to why the coal garden grows and why it needs to be "watered" in order for it to remain growing.
3. To introduce a method of setting up scientific experiments.

BACKGROUND:

Perhaps it has been a long time since you have thought about making a coal garden -- probably because it is almost impossible to find coal any more. However, this unit allows the same reactions to take place without using coal. Brick and synthetic foam rubber or cellulose sponge have been substituted in its place.

Some day when you have planned a field trip or when it is rainy and not fit to do any outdoor studies, why not let the children help you construct a coal garden -- or better yet, make several and let them compare the differences between them and discuss why the coal gardens all look different.

EXPLANATION OF THE CHEMICAL REACTION WHICH TAKES PLACE:

The principle is similar to the reaction which occurs when stalactites or stalagmites are formed. The solution mixed up contains some dissolved solids. The solution is poured over a porous material which soaks up some of the solution to allow controlled expansion or growth in the coal garden. Crystals are formed as the liquid passes into the porous material. The solution now "feeds" the crystals and allows them to grow. Growth will take place until all of the solution is used up. If you wish the garden to grow, you will need to add more solution. The porous material will soak up the liquid and feed the crystals to allow more controlled growth, etc.

This is an excellent experiment for showing some basic physical and chemical forces in nature. Have the students (especially upper grade ones) look up and study the following words and see how they apply to this particular experiment:

1. percolation
2. absorbtion
3. evaporation
4. diffusion

ACTIVITY:

Discuss what a coal garden is and explain the ingredients that are used. Ask a few simple questions similar to these:

1. What is a coal garden?
2. Why is it called a garden?
3. Will it grow like your garden does at home?
4. Will it need to be "watered" like your garden does?
5. What will happen if you don't add the necessary ingredients at the appropriate time?
6. What causes the garden to grow?

Build a castle! This one is as old as the hills, but we have a new way of making it that should be a delight to everyone.

People used to call this a coal garden, but we found that chunks of broken brick (about the size of a large egg), porous rocks, (not slick ones) and pieces of synthetic foam rubber or cellulose sponge were even better. Sponge is great because it can be cut in any shape you desire. We made one the shape of a little Christmas tree with branches and all.

Wash your pieces of brick in plain water until they are thoroughly wet. If you use sponge, wet it and wring it out.

Place in a shallow glass bowl (do not use metal of any kind), and arrange the damp pieces to fit your fancy, placing some on top of one another. Don't throw away any little pieces or granules; just dump them on top and wonder what is coming!

Into a glass fruit jar, put four tablespoons of water, four tablespoons of laundry bluing and four tablespoons of ammonia. Pour this over the wet rocks, making sure all are dampened with the mixture.

Put a few drops of food coloring (just one color or several different colors) and add a few drops of bluing on one or two of the bricks. Now, take four tablespoons of salt and SPRINKLE this evenly all over the broken chunks of brick, rocks or sponge. If you have an old plastic flower, it is darling if it is stuck into the arrangement. It will make your coal garden look like an oriental garden.

NOTE: Coal gardens in which only one color of the food coloring is used are much more attractive. The gardens in which several colors are used tend to become very dark colored and not as pretty.

Within a few hours, snowflakes begin to form. If you sit and watch closely you can actually see them grow.

After two days, add two more tablespoons of water and two tablespoons of ammonia. Be very careful not to pour it over the pretty crystals, but along the edge of the bowl.

GETTING TO KNOW THE THERMOMETER

OBJECTIVES:

1. To introduce the students to various types of thermometers and how they are used.
2. To help the students understand the basic mechanics of how and why the thermometer reacts as it does to hot or cold substances.

BACKGROUND:

The children could learn the following riddle and act out the action parts of it.

THERMOMETER RIDDLE

My blood is red,
When it's cold I fall;
When it's hot I rise,
I'm useful to all.

ACTIVITY:

To make a thermometer for kindergarten use, simply cut two pieces of white tagboard in the shape of a thermometer. Cut out a thin rectangular shape and run a piece of bright ribbon (one of red and one of white connected) through the middle to depict the mercury. Then, the teacher or the students can pull the ribbon either way to depict temperature rise and fall.

It is suggested that numerals be printed on the thermometer to indicate the different temperatures even though the kindergarteners can seldom read them at the beginning of the school year. However, as the year progresses, there might be added interest if students can read the various degrees they can depict by pulling the ribbon from either the top or the bottom of the thermometer. The important thing (whether or not the students can read) is that they be able to make a comparison of what the reaction would be to either hot or cold substances

The thermometer is a good instrument to use to introduce kindergarteners to the wide area of education. Students can begin unlocking their own door to scientific research and discovery by using the thermometers to test any variety of things for temperatures. Children might be interested in seeing and using the many various types of thermometers there are (outdoor, people, candy, meat, etc.). Perhaps it would be fun to station a thermometer outside of the classroom window where the students could keep a watch on temperature fluctuations.

It might also be fun to make a batch of candy (letting the children do the measuring, etc.). to help them to understand the practical use of the thermometers in our every day lives. After using the thermometer and experimenting with it, the children will be able to conclude rather quickly that the thermometer will show a temperature rise almost instantly when it touches the boiling candy. An added treat will be eating the candy that all of the children have helped to make.

The following is a recipe which is a simple enough recipe for kindergarteners to help make. In addition, it is almost impossible to have a failure with this particular fudge recipe.

FANCY FUDGIES

2 cups sugar
1 cup evaporated milk — Bring to boil and boil ten minutes
½ cup butter or oleo

****

1 cup chocolate chips
3/4 cup flour
3/4 cup nuts (optional) — Add and beat well. Spread
1 cup graham crackers (crushed) — into buttered pan.
1 teaspoon vanilla

A brief explanation might be given concerning the mercury or alcohol in thermometers and why it reacts as it does to hot or cold substances.

Then, the children might be given an introduction to thermometer use by allowing them to test various things in the classroom. Perhaps the teacher will want to provide some things so that there is enough variety and temperature variation in order for the students to be able to begin to make generalizations about how hot or cold things affect the thermometer. (Snow and the human body express temperature differences which may serve well in demonstrating the thermometer).

The following questions might be asked:

1. Have you ever used a thermometer? For what?
2. Why or how do we use the thermometer?
3. What things can a thermometer tell us?
4. If something is hot, will the mercury rise or fall? If it is cold?
5. How many different kinds of thermometers can you think of? List them.

Take the children outdoors and have them test a large variety of things for temperature fluctuations and differences. It would be especially interesting to measure air, land and water for comparisons, for example.

As a culminating activity, children might enjoy listening to and discussing the following poem or song of their own,

THE THERMOMETER

If we can read thermometers, they help us all to know
The way to dress, and where to go, and the kind of games to play.
If that red line is pretty high -- at 70° or so,
It's summertime, and we all know it's a very pleasant day.

When autumn comes it's cooler: it may be 50 degrees.
The summer's gone, the leaves are brown and we are back in school.
It's fun to play outside each day; we like the nice cool breeze.
"Wear a sweater or jacket," we all know is a good health rule.

Soon autumn days are over, and winter is here again.
The thermometer stays below 30, and we say, "It's pretty cold!"
The weatherman is never sure whether to let it snow or rain.
Our coats and caps and boots feel good; we don't need to be told.

Some days the wind blows fiercely, and the snowdrifts pile in rows.
The thermometer stands at zero, and sometimes below it goes.
We can ice-skate when it warms a bit, if we wear our warmest clothes.
But we must be careful all the time, or we'll freeze our ears and nose.

The above poem taken from an Instructor handbook entitled, Skill Games for Mathematics by Clyde G. Corle.

WHAT IS IN COMPOST?

OBJECTIVES:

1. To employ materials taken from the soil by returning them to the soil.
2. To provide the students with the actual experience of making and using compost.

MATERIALS:

Wooden box or small fenced area, leaves, garden clippings, animal wastes and other compost material

BACKGROUND:

This is an excellent unit to introduce natural fertilizers, air pollution and how natural things are returned to the soil. The activity can be a combination of providing for our needs of fertilizers and eliminating some air pollution. Since we need fertilizers why not make our own from leaves instead of burning them? By making compost students are also observing how plant materials are returned to the soil.

ACTIVITY:

1. How many have ever heard of compost?
2. What do you do with your leaf rakings in the fall?
3. What does burning do to our air?
4. Do you suppose we could do anything else with these leaves to make them more useful?
5. What happens to the leaves in our groves and forests where we don't rake?

Explain that materials taken from the earth by growing plants need to be replaced. This is done either by man made fertilizers or a natural cycle of decaying materials being returned to the soil. By making compost we are saving food taken from the soil by restoring it to the soil.

Set up a wooden box or a fenced area in an undisturbed area. Have the students gather leaves and other compost materials and place in the box. Spread the compost material 6" thick;then put a thin layer of soil over this; begin with compost material again. The mixture should be watered frequently to speed decay for about six months before using it.

Try making the compost in the fall. Then for a spring activity use the compost around new trees and shrubs around the school.

To culminate this activity into home usefulness discuss with students what we can do to make this at home. Suggestions may be to form a block or neighborhood compost if they live in town. A garden edge or a lawn edge may be convenient if students live in the country.

DISCOVERING DIRT

OBJECTIVES:

1. To assist students in discovering the different properties of various kinds of soil.
2. To develop a better understanding and appreciation of soil.
3. To develop awareness of the many kinds of plant and animal life in the soil.

MATERIALS:

Different samples of dirt
spoon, stick or digging device
magnifying lens
Chi-Jet paper plates
Jar or container
Large plastic sheets (optional)
microscope

BACKGROUND:

One segment of our environment, the soil, seems to easily attract the interest of young children. In play they explore sand, rocks and dirt whenever possible. Why not take advantage of their natural curiosity about soil, and develop a better understanding and appreciation of it? The following activities utilize a child's interest in playing in and with the dirt.

ACTIVITY:

What is dirt?
What is dirt used for?
What lives in dirt? (Plants and animals.)
What part of the plant lives in the dirt?
Is soil all the same color?
Does dirt all feel the same?
Are all particles of dirt the same size?

Take the class on a trip outdoors for the purpose of exploring the dirt. Lead the students into the discovery of the different textures of soil. Look for areas where the soil is packed hard (perhaps on the driveway or path). The baseball field will have areas where the soil is loose and dusty. Under low shrubs the soil is likely to be loose, crumbly and damp.

If possible, go to a gravel pit and observe the different layers of soil. Is each layer the same color? Is each layer the same size? Check the texture of each layer, look for plant and animal life. Collect a sample of each layer and take back to the classroom to explore.

Take the samples you have collected back to the classroom and have the students put their samples on paper plates, and let them explore the dirt. Encourage close examination by asking questions such as the following:

1. Have you seen soil which has a texture like this before? Where?
2. Are all the samples of soil the same color?
3. Do all the soils feel alike?
4. Let the dirt sift through your fingers. Does each sample sift the same as the others?
5. Squeeze a handful of each sample. What happens? Does the soil stay in a ball or fall apart once you realease your grip?

low, take a closer look. Give each student a spoon, stick or some other tool for digging, and let the students explore for other forms of materials which might be hiding in the soil. Earthworms, insects, (both dead and alive), leaves, sticks, bark and small rocks are common materials that can be found in the soil. The use of a hand magnifying lens and a microscope is recommended.

There are many things you can do with a soil study; listed are some ideas:

1. After studying the soil samples and discussing the different types, try planting seeds. Be sure to use as many different types of soil as possible, such as organic, clay, sandy, etc. Plant the seeds, water and give each plant the same amount of sunlight. This experiment should draw some interesting conclusions. Let the children draw their own conclusions.

2. If the students observed the soil profile on the field trip, try constructing soil layers. This can be done by gluing strips of soil to tagboard. Encourage students' participation by asking questions.

   What kind of soil is on the top?
   What is the soil called?
   What color is it?
   What kind of soil is the next layer?
   What is the name of this soil?
   What color is it?
   What does it feel like?
   Does the next layer have a different texture?
   What is it called?
   What is it made of?
   How does the next layer differ from the rest?
   What is it called?
   What is this layer made of?

3. Try soil painting. Here are the directions:

   1. Spread out your soil samples to see what kinds you have.
   2. Decide on a picture. Either have the children draw a picture, or ditto pictures for each child.
   3. Mix 1 part glue and 1 part water.
   4. Use a paint brush to apply glue on areas of the picture you want to cover with soil.
   5. Sprinkle soil onto the glue. Leave the soil on the paper until the glue is dry. Continue until all desired areas are covered by soil.
   6. Color or paint the other areas as desired.
   7. It's not difficult to preserve your soil painting. When the glue is completely dry, shake off excess soil and repair any areas that need it. Spray with plastic or lacquer.

ENVIRONMENTAL HOPSCOTCH

OBJECTIVES:

1. To recognize and identify some of nature's characters.
2. To improve large motor skills.

BACKGROUND:

Hopscotch, a very old game, can have a new and interesting approach. It can be used as a game of recognition and identification of many of nature's characters. Hopscotch is a good way to either review or introduce another activity or it can be just a spare time project.

ACTIVITY

Use this game as a test to see how much the children know about their environment.

1. Set the game up on brown wrapping paper, just like regular hopscotch.
2. Place in the squares pictures of birds, animals, insects, animal tracks, shapes, colors, etc. Almost anything you want to study could be used.
3. Take turns like in regular hopscotch. The object of the game is to name all the pictures correctly.
4. Throw the marker, name the picture. If correct, the child can hop. If incorrect, the child looses a turn. The child who completes the whole game first is the winner.

A JOY BREAK

OBJECTIVES:

1. To study the meaning of joy.
2. To create an activity for self expression.

BACKGROUND:

Someday when you need to break the routine of an average day, try this activity. It will relieve the tension and may prove to be a very exciting way for the students to express some of their own opinions on life.

ACTIVITY.

1. What does joy mean to you?
2. Define joy and how joy is a matter of opinion. Joy or happiness will all depend on the person. Discuss moods and how moods sometimes play an important part in our decision making.
3. Discuss living and non-living things and how they can be humorous.
4. Discuss things that are sad, why they are sad, and if there is any way of making them happy again.
5. Discuss ways that make you happy, others happy, animals happy, etc.

Explore any area: the schoolyard, park. Wetlands or any place with a variety of natural objects. Have the students look for things that mean joy to them. Look for something that would make someone else happy, such as seeds, berries and worms for birds; buds and leaves for trees. Find as many things of joy as you can. Look for things that seem sad; try to find out why they are sad. Bring some of the objects back to the classroom.

Have the students create a picture or collage with the objects. Underneath the picture, write a brief story or explanation of why these objects made you happy. Younger students can tell <u>why</u> and the teacher can record the story for them. The same thing can be done with sad objects -- telling why they are sad and what could be done to make them happy.

MATH ALL AROUND US

OBJECTIVES:

1. To use nature as a study area to complete math problems.
2. To develop an awareness and appreciation for natural objects.

MATERIALS:

cards with math problems
stated on them.

BACKGROUND:

Children need to work with concrete objects, especially in math. This unit is designed to help either introduce or review a math problem. By gathering objects on a field trip, students can either work the problems given to them by the teacher or make up their own.

ACTIVITY:

This activity can easily be accomplished within walking distance of the school. Divide the class into working groups, giving each group some problem cards to complete. Explain to the class that they must find the correct objects to complete their cards. These math cards can be set up 3 ways:

1. 2 red  's + 4 red  's =
2. stones + stones =
3. 2 green + 6 green +

After returning to the classroom, paste the object in the correct places. Any left over materials could be used to make either individual or group math cards. Let the students use their own imaginations.

EXPLORING A NEST

OBJECTIVE:

1. To study the contents of a nest

MATERIALS:

nests

BACKGROUND:

The contents of a nest can tell many interesting stories about the wonders of nature. For both the students and the teacher it will be surprising to see how a nest is constructed and what goes into constructing a nest.

This activity will allow the students to explore the contents as well as the construction of a nest. By dissecting a nest students will soon discover that nest patterns vary, material contents vary and food preferences vary among the different species.

ACTIVITY:

Are all nests the same size?
Are all the nests made of the same material?
What are some of the things you might find in a nest?
What lives in a nest? Is it just birds?
How could we find the answers to this question?
Introduce the idea of taking a nest apart to find out the answers.

A grove of trees will have an ample supply of abandoned nests. (Be sure that the nest is abandoned.) Gather as many nests as needed, one to every three or four students. Try to get a variety of nests so that a good comparison can be made.

Discuss the different materials of construction.
List the animal life found.
Discuss the other findings. Such as mud, grass, twigs, thread, yarn, feathers, seeds, etc.
Try planting a nest. The procedure would be the same as that of a seed. Water it. Watch to see what kind of plants will grow.

APPENDIX E

Observation - Senses

STUDYING NATURAL MOVEMENT

OBJECTIVES:

1. To develop an awareness of natural movement.
2. To intrigue student imagination concerning creative and dramatic movement.

BACKGROUND:

Much too often we take for granted the movement of the world around us. Almost everything around us moves -- if not on its own, by some other force. Movement is natural; almost everything moves and needs to move. People need to move, for many reasons. One reason is to communicate with other people. Simple gestures add a lot to what a person says. The expression of his eyes and face mean so much to the receiver.

As long as children like to move, why not encourage them to use their imagination when manipulating their bodies? Thus, through simple activities, the child begins to understand the space and design of his environment.

Introduce the activity to the children by discussing movement with them.
How do you move around? (feet, cars)
How do animals move? (legs, wings, feet, fins)
How do plants move? (wind, breeze, animals, grow)
Do plants move from place to place?
How do they move?
Does everything move the same way?
Can you name different ways?
    Animals - walk, crawl, run, fly, hop, swim
    Plants - sway, bend, fall
Can you describe a --
    falling raindrop?
    falling snowflake?
    blooming flower?
    bird leaving its nest?

Go to an area where there is a lot of mammal, bird, insect and plant life. Have the students watch for movement and as they see anything, have them move as much like the object as possible.

The teacher can make a list of different movement. Then for an exercise or dramatics class, have the children act the movements out. Let the children move to music in a creative, dramatic way -- the music selected should have sufficient changes of tempo to provide for different movements. A general idea may be selected to fit the music. For example, going on a field trip, scavenger hunt, nature hunt, etc. Encourage children to express their moods and feelings through music. Encourage creative movement. Use your whole room and your imagination. Do not demonstrate! Examples which might be used are as follows:

1. Show me how tall you can be.
2. Show me how wide you can be.
3. Show me how tall and thin you can be.
4. Show me how long and thin you can be.
5. Show me how wide and short you can be, etc.

6. Standing in your own place, make your feet move fast; slow.
7. Move your hands fast; slow.
8. Show me how slow you can walk and then how fast.
9. Be a bud unfolding

falling leaf	ant in an ant hill
bee in flight	creeping caterpillar
grain in the field	frog
cloud	fish
wind	falling raindrop
tornado	falling snowflake
bird hatching	thunder storm
spider spinning its web	the sun

any other natural object whose movement could be imitated by the students

10. Have the students act out some short fingerplays, poems or stories. Some examples are as follows:

WHIRLING LEAVES

The little leaves are whirling round, round, round,
The little leaves are whirling round, falling to the ground.
Round, round, round, round,
Falling to the ground.

CATERPILLAR

Poly poly caterpillar
Into a corner crept
Spun around himself a blanket
Then for a long time slept
Poly poly caterpillar
Wakening bye and bye
Found himself with beautiful wings
Changed into a butterfly.

RAIN

On Stormy days
When the wind is high
Tall trees are brooms
Sweeping the sky.

They swish their branches
In buckets of rain
And swish and sweep it
Blue again.

SNAIL

The snail is so slow, the snail is so slow.
He creeps and creeps along.
And as he does he sings his song;
The snail is so-o-o-o-o-o-o- s-l-o-w-.

LITTLE CHICKEN

I think when the little chicken drinks
He takes the water in his bill
And then he holds his head way up high
So the water can run down hill.

ANIMALS

Frogs jump
Caterpillars hump

Worms wiggle
Bugs jiggle

Rabbits hop
Horses clop

Snakes slide
Seagulls glide

Mice creep
Deer leap

Puppies bounce
Kittens pounce

Lions stalk
But --- I walk!

FLYING KITE

Since it is such a windy spring day, let's go fly our kites. Everyone grab your kite from the wall and run outside. Now that we are outdoors let's all pretend we are throwing our kites in the air and unwinding the string. Goodness! The wind has caught our kites and they are madly flying in the air. Can you all swing like a kite that is flying in the sky? Oh my! The wind has gone down and our kites are slowly tumbling to the ground. Let's all be like the kites that are falling to the ground. Oh dear, it is time to go back to school; quickly get up and take your kite and let's all form a line and be like marching soldiers. We will march to school.

A WALK IN THE WOODS

Today boys and girls we're going to take a walk in the woods to see all the wonderful animals that live there. Let's all hold hands and follow me as we wind our way deep into the woods. (Here the children would take one another's hand and follow the instructors as they go into the woods.)

Do you see any animals yet? Oh, there, I saw one! Why it's a baby rabbit hopping along. Can you hop around like the little rabbit? Let's try it.

Shh! Be very quiet and we can all see a butterfly. A great big beautiful butterfly with all different colors on his wings.

Oh, there she goes flying away. Let's be butterflies and flap our pretty wings in the air. Here we go, flap...flap.

That was fun, I wonder what else we can see? Oh, look, there goes a fox running through the woods. See how fast he can run! Let's be foxes and run through the woods, here we go, run fast! I think we were all very good foxes and now it's time to go home.

SPRING

Spring is coming, isn't it? And all sorts of new things are growing: the grass is coming up through the black dirt. Let's all be a little grass blade pushing his way through the dirt to the sunlight.

And in spring flowers blossom. Let's pretend we're a little flower blosson beginning to open.

There's a mother robin gathering twigs for her nest. You gather twigs as if you were a mother robin. Oh, and there are some baby birds learning to fly. Now you fly as if you were a baby bird. Now, everybody be a cloud and gently float away in the sky.

THE WEATHER

Let's pretend we're the sun today. Stretch up your arms in a big circle. Stretch up high and wide! Oh, oh, the wind has started to blow. Swing your arms like the wind. Turn yourself around and around. Don't forget to swing your arms! The wind has finally stopped blowing and now it's beginning to rain. Try to run around the room softly and make your feet go pitter patter like the raindrops. Run on your tip toes. Pitter patter. Look! The rain has turned into hail. Hail is little balls of ice that fall like rain. Let's hop around now like the hail bounces on the ground. Hop and hop. The hail has finally stopped, but it's snowing now. Stand still and raise your arms up. Bring them down softly as you wiggle your fingers. Do it again! Be quiet though because the snow doesn't make any noise when it comes down!

PLANTING - SCIENCE

We are going to plant a garden today. You can plant flowers, or trees, or vegetables, anything you want.

First we have to pick up our hoe and dig a row in the dirt. Dig, dig, dig. Is your row ready for your seeds? Turn around and pick up your seeds. Now drop them in the straight row you made. Drop, drop, drop the seed. Does everyone have their seeds in their row? Everyone's doing such a good job.

Next, spread your dirt over the seeds. Push the dirt over your row of seeds, push, back and forth. Make sure you cover all of your seeds.

Now we're going to water our seeds. They get thirsty just like we do. Every one pick up their sprinkling can. It's full of water so we can sprinkle it over our seeds. Sprinkle, sprinkle, swish, swish. Our seeds will need sunlight, too. Then they will pop up above the ground.

Now we'll have to wait for our seeds to turn into plants. We'll come back again and see what kinds of plants we have. Let's leave our garden and go back to the school.

JOY IN THE GARDEN

Come along with me for a <u>walk</u> in my garden. First we have to <u>push</u> the heavy gate open. Stay on the path. Stay in a <u>line</u>. Be careful. Do not step on the flowers. Look at that bright red tulip. Isn't it pretty? Oh, what is that on the tulip's petal? It is a beautiful blue butterfly. There he goes now into the sky. Let's <u>fly</u> high into the sky and try to <u>catch</u> him. I guess he flies too high for us. Here is a patch of clover. Doesn't it look soft? Let's <u>roll over and over</u> in the clover. Now we are ready to <u>walk</u> again. Stay on the path. Oh, remember to take a <u>jump</u> over that old tree stump on the path! Here we are in the field of tall bright sunflowers. I wonder how tall they are. Let's <u>stretch up</u> and reach the top of the sunflower's cup. The sun is setting now for the day; let us <u>sit down</u> and watch it. Now let's follow the <u>path</u> to the gate. Remember to <u>pull</u> the heavy gate closed. We will come to the garden on another beautiful day, and we will play again.

LISTEN

OBJECTIVES:

1. To create an appreciation and awareness of the sounds of nature.
2. To give students specific exercises and experiences in hearing discrimination.
3. To demonstrate to students how much they can learn about an area by using only their auditory sense.

MATERIALS:

tape recorder
toy animals
animal pictures

BACKGROUND:

We often take for granted the importance of our ears in our daily lives. We rely on them very heavily for signals and communications. We need to develop in young children a process by which they learn to listen and associate meaning to what they hear. We are guilty of saying, "in one ear, and out the other." Maybe we should try to develop a better attitude in our children about the importance of listening.

ACTIVITY:

The following are suggested activities which may be used to motivate students:

1. Use a tape recorder and have a pre-taped set of sounds recorded on it. Use a variety of sounds, both common and unusual. Let the children guess what the sounds are.
2. Ask the students to close their eyes and listen carefully. After the teacher makes a sound, the children are asked to do just as she did. Some ideas are as follows:
   a. three slow claps
   b. complete silence
   c. two fast claps
   d. clap, snap, clap
   e. snap, snap, clap
   f. stamp, snap, slap
   g. stamp, stamp, pause, clap, pause, snap, etc.
3. During quiet periods, encourage students to listen to the different sounds in the classroom. For example: tick of clock, chair squeaking, cough, shuffling feet, etc. Discuss the sounds; which ones were loud? Which sounds were softer? Sounds from the environment may be studied in the same way. Or, instead of doing this activity for an extended period of time, do it several times throughout the day. In changing from one activity to another, just say, "Stop, listen. What do you hear?

4. Give each child a toy animal. If you do not have enough toys, pictures may be substituted. Ask them to listen carefully. The teacher makes an animal sound. When the students hear the sound their animal would make, they bring the toy or picture to the teacher. Another way to do this is to point to a child to make a sound. The one who has that animal must then switch animals with the one who called. It is then their turn to make a sound.
5. Ask the children to imitate various human sounds. Examples: laughing, singing, crying, shouting, whispering, etc.
6. Have the students imitate animal sounds - Read a story in which the children fill in the appropriate sound. Sing "Old McDonald's Farm."
7. Talk about the sounds of weather. Examples: Wind, thunder, lightning etc. Does snow have a sound?
8. Birds Fly
An old game, always popular because it demands a quick response to hearing.

Everybody stands informally, at arms length from one another. "It" tries to fool them by naming not only objects that fly, but also those that don't fly. Players must flap their arms every time a flying object is named, such as: "geese fly" "planes fly", etc. They must not flap their arms when "It calls, "dogs fly", "Pigs fly", etc., even though "It" flaps his arms and tries to fool them into imitating him.

9. Indian Hike
Go single file V-E-R-Y carefully. Try not to make a sound. Avoid stepping on dry twigs or through dry leaves. Don't talk above a whisper. Stop frequently to listen as well as look. What sounds can be heard? Listen for wind, song of a bird, rustle of some small animal, a distant plane, water running, leaves rustling, squirrel chattering, insect humming, etc. Look for sources of all sounds.

10. Have the students look at "action" pictures. Can they "see" sounds? Make a list of them.

LEARNING BY SNIFFING

OBJECTIVES:

1. To acquaint students with the variety of odors in the environment.
2. To impress students that unpleasant and pleasant smells are often a matter of personal opinion.

BACKGROUND:

Our attitudes towards our surroundings are governed by our senses. We have a habit of classifying things as good or bad by their appearance, smell or feel. Some things that are pretty might have a bad smell, or a bad texture and therefore, they are bad. This is really not desirable, for some things which look, smell, and feel bad are necessary for our existence. The students will be introduced to classifying as to pleasant or unpleasant. The unpleasant smells should be categorized as necessary or unnecessary, e.g., a decaying animal (necessary) or polluted river (unnecessary).

ACTIVITY.

Introduce the activity with questions:

1. What do you think smells unpleasant (stinks) ? Make a list.
2. What can you think of that smells good? Make a list.
3. What can you think of that smells sweet? Make a list.
4. What can you think of that smells sour? Make a list.
5. Would you rather smell a feedlot or a sewage lagoon?
6. Which do you get the most benefit out of? Let's take a field trip and discover what we can smell. Make a list of what smells there are. Note whether they are good, bad, etc. List things that smell alike.
7. Have them bring some things from home that smell and compare them.

Most schools will have areas available that will give the students a wide variety of material to smell. Give them a chance to smell anything available and give it a classification. Have them compare the smell of polluted water and tap water, garbage and fresh fruit, dead creatures and live creatures, city dump versus the wetlands woodlot, etc.

Make a chart of the different things they smell and how they categorize them. Now ask them how the areas and the smells affect their lives. Ask them if areas and smells are necessary or not. You may have to explain the difference between a sewage lagoon and a polluted stream, why one is necessary and one isn't.

1. Keep a list of smells on the board and add new ones that children bring in. Classify smells as home smells, barn smells, street and town smells, school smells, etc.
2. Try having kids pantomime or mold in clay what they think a smell looks like. Have others guess what it is.

TEXTURE OF A NATURAL OBJECT

OBJECTIVES:

1. To acquaint students with the feel of natural objects.
2. To assist them in discovering the various textures of natural objects.
3. To increase students' awareness of the environment.

MATERIALS:

large paper bags

BACKGROUND:

Natural objects all have certain types of textures associated with them. There is a definite reason for the texture of each natural object. The reason something has a certain texture is as important to a child as being able to distinguish between the different textures. This activity is an excellent way of introducing an awareness to young children of the fantastic variety of shapes, forms and textures of objects found in nature.

ACTIVITY:

Ask the children the following questions or some similar to them:

1. What does an egg feel like? Is it rough or smooth? Is it hard or soft? Is it solid or spongy? Is it prickly or dull?
2. Name something natural that is rough.
3. Name a natural object that is soft.
4. Name a natural object that is spongy.
5. Name a natural object that is prickly.

List answers on the board along with any other textures that the students might be able to distinguish.

Take the children out on a field trip. Ask them to collect as many objects as they can which feel differently. Have them put the items into their sacks and bring them all back to the classroom.

OBJECT CHARACTERISTIC HUNT

Instructions: Objects (pebbles, sticks, leaves, your dog, your cat and other things) have certain things distinctively theirs such as color, shape, feel, etc. These things are called the characteristics of an object.

You and your teammates are to chose one characteristic (for example, all red, all round, all with points, etc.). Collect objects showing this property. Don't tell anyone but your partner what characteristics the object you are collecting show. Bring back your collection and have the other students guess what characteristics you were looking for.

Students should take a plain piece of paper out on their field trip and sketch objects which cannot or should not be brought back into the classroom. Ask each student to show what they found in each category. Have them arrange their articles in the various categories on a work table and then put them to work comparing the different textures present.

Who found the most different kinds of feelings?
Who found the most unusual kinds?
Do some of these things feel sticky and rough?
Do some of these things seem smooth and sharp at the same time?

COLOR IN NATURE

OBJECTIVES:

1. To introduce students to various colors and their identification in nature.
2. To help students understand that seasonal changes often result in color changes.
3. To assist students in recognizing colors and color changes in nature.

MATERIALS:

crayons
shoe boxes
construction paper
paper bag

BACKGROUND:

Color changes tell us a lot about nature. When we see leaves on a tree change colors, we know that something important has happened to the tree to cause this change. When the weather changes, colors often change. For example, each season of the year has a whole new set of colors.

In the spring and summer, the weather starts getting warmer and the color we see most often is green.

In the autumn or fall, the weather becomes cooler again. The green grasses and leaves turn to shades of brown, yellow and orange.

When the cold winter comes, no green grass, trees or flowers are left. The ground is covered with snow. What color is snow? What other colors can we find in the winter?

ACTIVITY:

To insure that students are able to identify colors a short activity should be done in which they do color matching. Some suggested activities are as follows:

(1) Bring various fruits and vegetables (real or artificial) to the classroom. Have the students sort them according to colors -- putting all of the red together, etc.
(2) Empty several boxes of crayons together and have the children sort them according to colors.
(3) Assemble the children on the floor in a circle. Place three shoe boxes in the center of the circle. On one shoe box, tape a piece of red construction paper, on a second a piece of blue, and on the third, a piece of yellow. Cut several pieces of paper in these three colors. Scatter them around the circle and ask the children to place the pieces of paper in a shoe box which has the matching color. You might make colored animals of the several colors as an added variation of this game.
(4) Give each child a piece of colored paper and a catalog or an old book. Have him find as many items as he can in them that are the same color as his sheet of paper. For motor coordination exercise, have the students cut out the pictures that they find.

Ask the following preparatory question for the field trip:

1. What causes things to be different colors?
2. Are some plants or animals several colors? Why?
3. Can we change the color of things? How? (Dye materials, pick fruits and let them ripen, burning, etc.)
4. Why do things change colors?
5. How can things be two different colors at once?

In preparation for a field trip have the students bring a paper bag. Pin or staple two colored pieces of paper or material onto it, one common color and one rare one.

Take the students out to an area where there is a large variety of plant life -- grassland and woodland. Have the children collect all of the things they can which are the same colors as the tags attached to their bag. Litter counts also; in fact, some colors may be found only on litter of some type.

Take the bags back to the classroom and have the students empty the stuff out of their bags and study it. Have them count the number of each kind of thing they found. Which thing did they find most frequently? Have them make posters. Ask them to take their crayons and try to duplicate the colors of the natural items they found.

Take the students on consecutive field trips in the winter and spring and/or summer. The students should be able to conclude that they will find different colors at different times of the year.

IN WHAT SHAPE IS YOUR ENVIRONMENT?

OBJECTIVES

1. To introduce the concept that our environment is made of many different shapes.
2. To introduce various shapes and their identification in nature.

MATERIALS.

large paper sacks for each student

BACKGROUND:

Most things have a definite shape. Some are simple, while others are more complicated. Our environment is made up of many different shapes--cylinders, circles, triangles, squares, rectangles, octagons, etc. However, they are seldom perfectly shaped. Usually, the likeness is great enough to enable most students to find and identify them in nature.

ACTIVITY:

To insure that all students know the various shapes and can recognize them.

A few examples of simple games which might be used are as follows:

1. Have the students identify different shapes in the classroom by telling the object and its shape.
2. Give the students construction paper shapes and have them sort them into piles of the same shapes.
3. Ask some preparatory questions:
   a. What is the shape of a circle? Can you show me?
   b. What is the shape of a square? Show me.
   c. What is the shape of a triangle, cylinder, rectangle, etc.?
   d. Can you name something that is circular, square, cylinder, etc. shaped?
   e. Can you name something that is triangular shaped?
   f. What is the shape of a cottonwood leaf?
   g. What is the shape of an elm leaf?
   h. What is the shape of a rock? Do rocks have various shapes?

Go to a park, school yard, wetlands or any place which has a good variety of plant life and natural objects. Have the students collect as many different shaped objects as they can find.

Take the paper sacks back to the classroom for further investigation.

Have the students empty the stuff out of their sacks and study the shapes, count the different shapes and discuss those which were easy to find and those which were more difficult to find.

If desired:

Count the shapes either by giving the children a sheet of paper with the shape on it and/or putting large sheets up for the whole class to see.

Have the students find a natural object to fit the shape of construction paper. . . . . or mount the natural object on a piece of paper and trace the shape around the object.

SHADOWS

OBJECTIVES:

1. To introduce the students to a simple exploration of shadows.
2. To allow students an opportunity to experiment with spatial relationships.

BACKGROUND:

Have you ever seen your shadow? Shadows are caused by a light source such as the sun outdoors or the lights indoors. The size and shape of our shadow depends on where the light source is.

ACTIVITY.

Take the students outside and let them experiment with their shadows. Let them play some games with their shadows. (With a little practice, they should be able to manipulate their shadows in order not to be tagged.)

Some games the students might like to play:

A. Shadow Tag

1. 'It' touches his shadow to the shadow of another person.
2. 'It touches another's shadow with his foot.
3. Use either of the above and make the shadow of a stationary building as a safe place.

B. A Shadow Keep Away Game

1. Establish boundaries and limit the class to them. Choose a partner and try to keep that person from stepping on your shadow.

Have each child bring to school a large, light object such as garbage can covers, hoola hoops, umbrellas, brooms, inner tubes, cardboard boxes, etc.

Divide the children into teams of two. Give each team a piece of chalk and a huge piece of white paper. Have them spread out over a parking lot or some other paved area. One of the children will manipulate the object he brought from home while the other sketches an outline of it. How many different shapes can the children create from one object? How large can they make the shadow? How small can they make their shadow? How skinny or fat can they make their shadow?

Shadow People

a. Have the children divide into teams of two children each and make sketches of their bodies in different positions. Have them make monster people.

b. Combine every team of two into groups of four. Have them take turns being the person who does the outlining. The other three children can construct some design or picture using their shadows. See how many different shadows and designs they can make. Can they make animals?

Have the children spread out the large pieces of paper on the floor and create an artistic picture from it. Perhaps they can make animals, etc.
Let the children experiment with hand shadows on the classroom walls. What kinds of things can they create?

SOUND AROUND THE SCHOOL YARD ACTIVITIES

OBJECTIVES:

Using the senses

MATERIALS:

1 sheet of drawing paper (8½ x 11") (manila) per child.
Each child brings one dark crayon (green, black, brown, etc.).
Each adult leader should have a clip-board and paper and pencil.
List as many of the children's comments as possible for each activity.

ACTIVITY:

Tell the children you are writing down their descriptions.

At intervals throughout the activity, read back their comments to them.

At the end of each activity, read what was said as a summary.

Group leaders should give the comments and descriptions to the teachers at the end of the field trip for use back at school to make experience charts and story-writing.

Sound Hike - (10-15 Minutes)

Group leader takes kids for walk.

Stop at intervals along the way. Have kids close eyes and listen for 30 seconds. At end of 30 seconds, kids describe a sound they heard.
(Group leader should write down the way each kid described his sound.)
Try to stop in different places so there will be a variety of sounds to be heard.
See how many different sounds your group can discover.
Ask: Which sound did you like best?
Why?
Does it remind you of something else?
Which sound is the loudest? The quietest? The highest? The lowest?

Mini-Forest - (Approximately 15 minutes)
(Investigating an Arm-Circle of Grass)

1. Lie on the ground, face down.
2. Make a circle by stretching your arms out in front of you on the ground.
3. Find at least five different plants inside that circle made with your arms.
4. See if you can find any tiny animals crawling through the grass.
5. What else do you see? (Any dead leaves or twigs?)
6. Spread the grass apart and describe what you see.

Big Idea - Many plants and animals live together in a community.

Sketching

Find 2 trees with different shapes. Observe and sketch one tree at a time.

1. Look at the tree from a distance.
2. With your finger, 'trace' (in the air) the shape of the tree. (Do this from the ground up to top and from top down to ground.)

3. Describe the shape of the tree.
4. Make a "telescope" with your hands. Look through this "telescope" at your tree from a distance.
5. Describe how the branches go out from the trunk. (up? out? down?)
6. Hold out your arms to show how the branches grow out from the tree trunk.
7. Go closer to the tree. What else do you notice about it?
8. Get close to the trunk of the tree. Look up into the tree. What do you see?
9. Go to a comfortable place where you can see your tree. Sketch it with the crayon you brought.
10. Repeat procedure for second tree.

Add some of nature's color to your sketch.

Pick some grass. Use it as a crayon. Rub it around on the paper to show where the green is on your tree.

Pick a yellow dandelion blossom. Use it as a crayon somewhere on your sketch.

Touch and Feel Hike

Group leader takes kids for a walk. Gives following directio.. at intervals along the walk. (Add others when appropriate.)

1. Find the hairiest leaf around. Bring back a tiny bit of it. Compare with your other group members.
2. Find the softest leaf.
3. Find the smoothest rock.
4. Find the roughest twig.
5. Find something cool.
6. Find something warm.
7. Find something bumpy.
8. Find something dry.

"Color" Hike

1. Look for things that are different colors of green. Bring back 3 or 4 green things.
Arange them in your hand according to lightest green to darkest green.

2. Find and describe things that are: yellow-pink-brown-grey.

THINGS TO DO WITH TREES

Observe and compare the shapes of trees.
How many shapes can you find?
Discuss the shapes. Is it triangular? Like a column? Evenly tapered? Low and spreading? Regular? Irregular?
Find two trees with distinctly different shapes and sketch them.
Look for different shapes of trees on the horizon.

Observe and compare the branching of trees.
How many different directions do trees branch?
How do the branches grow out from the tree? Straight out? Out and then down? Out and then up at the ends?

Find two trees whose branches grow differently and sketch just the way the branches grow.
Write a comparison about the differences in branching of these trees.

Observe and compare the foliage of trees.
How many different textures of foliage do you observe?
Do the leaves grow up from the branches? Or do they grow down?
Do the leaves grow all along the branch, or only at the end?
Do the leaves hide part of the branch?
Find two trees with different textures and sketch your impression of the textures.

Observe and compare the colors in trees.
How many different colors can you find in the trees?

Observe one tree at various times of a sunny day and compare the light patterns.

Observe, sketch, or photograph the designs and patterns made by the shadows of trees.

Observe and compare the bark of trees.
How many different textures can you find?
Make bark rubbings with newsprint and crayon.

How do trees enhance the environment of your schoolyard?

1. Look for the different colors of the plant. Arrange the colors in a list--lightest to darkest.
2. Count and record the different kinds of plants that are below your knees:
   a. How many plants have few leaves?
   b. How many plants have many leaves?
   c. How many kinds of plants are stickery?
   d. Do any of the plants have flowers?
      List the colors of the flowers.
   e. Do any of the plants have seed pods?
      Describe the different pods.
3. Now record the same data for the plants that are above your knees:
   a. Number of different kinds?
   b. Plants with many leaves?
   c. Plants with few leaves?
   d. Plants that are stickery?
   e. Do any of these plants have flowers?
      List the colors of the flowers.
   f. Do any of these plants reach higher than your head?
      Describe the seed pods.
4. Are there any plants higher than your head?
   Are there many, or just a few?
   Describe these plants.
5. On a separate piece of paper, choose one of the following to do:
   a. Choose one weed and write a riddle about it, using four of the five senses to describe it.
      Which of our five senses would you not use?
   b. Write a poem describing the weed, or a poem telling about the color green.
   c. Write an imaginary story explaining how the tallest weed became so tall.

INTERPRETING CULTURAL HISTORY AROUND SCHOOL

Inventory building structures within a given distance from your school.
Develop a classification system for types of buildings. (Shape, roof shape and type, materials in construction, etc.)
Develop a means of classification for age of buildings.
Map the vacant buildings within a given distance of your school.
Determine how long buildings have been vacant. (Observe deterioration, interview local residents, consult written records, etc.)

What function did the building perform when it was in use?

What factors caused the building to become vacant?

Who owns the building now? Is there another possible use for the building?

Make an inventory of fences within a given distance of your school.
What different types did you find?
What different materials have been used in the fences?

Develop a classification system for the fences you observed.

Develop a chart showing the type of fences and their most common uses.

If possible, find pieces of discarded fences and construct a board of these, listing uses for each.

Use aerial photo to locate section corners in your area. If possible, go to that location and look for a witness tree. See if scribing is identifiable.

Locate the watershed in which your school is located. What land uses are in that watershed?

Locate the source of your community's water supply. What changes have occurred in the water supply situation in your community?

A MATH NATURE HUNT

OBJECTIVES:

1. To use nature as a vehicle to develop beginning thoughts in math sets.
2. To encourage an aesthetic appreciation for nature and one's environment.
3. To assist students with counting and identifying different objects as to color, shape, and texture.
4. To introduce the concept of "sets".

MATERIALS:

paper sacks
data sheet

ACTIVITY:

Review the concepts of counting, colors, shapes, and textures. Talk about and encourage student participation concerning things that one could look for in the out-of-doors. With the help of the students, compile a data sheet. Each child can make his own, or the teacher can make them ahead of time.

Example - Kindergarten

3 red leaves	2 circles
2 brown leaves	3 squares
4 yellow leaves	5 rough objects
3 buds	6 pieces of paper
1 feather	2 bugs
8 tiny rocks	bottles
1 large rock	3 soft things
1 triangle shaped object	

(For Kindergarten students, you may have to draw the object and color it, such as 3  's; color the leaf red and so forth, or have the students do this.)

First Grade:

10 seeds	3 buds
5 red leaves	2 triangle shaped objects
6 green leaves	3 circles
10 leaves with holes in them	6 squares
4 bugs	5 cup shaped objects
5 medium rocks	3 straight things
8 tiny rocks	2 rough things
7 feathers	1 shiny thing
7 pieces of bark	3 cylinder shapes

Go to a park, school yard, or any place with a variety of material for the children to find. Check the area before taking your class.

Bring the collected objects back to the classroom, discuss the things found, allow students to make comparisons, check for complete sets, and note unusual objects. The students may want to mount the objects for an art project, take their collection home, or save them for another math class.

1. One to One Correspondence

Have the students make a set from some of their gathered materials. Then, with another set of objects, have the students demonstrate one to one correspondence. Example:

Set of Leaves

Set of Flowers

2. For the first set of of objects you could have the students draw or cut pictures from magazines and then with natural objects demonstrate one to one correspondence.
3. Give each child a large sheet of paper with a numeral from 1-10 on it. Have the children find in nature a number of natural objects to match the numeral on their paper.
4. Introducing concepts of quantity. Have the children find objects or demonstrate the following:

big -- little	many -- few
long -- short	more -- less
tall -- short	some -- not any or none
high -- low	wide -- narrow

MATH READINESS, LINEAR MEASUREMENT

OBJECTIVES:

1. To introduce basic mathematical concepts as related to measuring and taking measurements.
2. To encourage students to develop the ability to make rational comparisons and conclusions from the data they collect.
3. To develop concepts such as larger-smaller, more-less, many-few, long-short, narrow-wide, etc., as related to measuring.

BACKGROUND:

Students in the early primary grades are generally not sophisticated enough to be able to work efficiently with ruler, yardsticks, or other measuring devices. However, this need not prevent them from learning about and experiencing linear measurements. Simple devices which are more easily understood by primary children can be improvised to show comparisons rather than a specific measurement in inches or feet, etc.

This unit has been designed to give primary teachers some basic ideas about simple measurements they can use with their students. It is hoped that the teacher will add others which would more appropriately serve their needs.

ACTIVITY:

Discuss how and why things are measured.

What devices are used for linear measurements?
ruler, yardstick, tapemeasure, meter

Why do people measure things?
How big is an inch?
How big is a foot?
How big is a yard?
How big is a meter?
What is the difference between a meter and a yard?
Which is bigger, an inch or a foot?
Which is bigger, an inch or a yard?
Which is smaller, an inch or a meter?
How long is a mile?
What instrument or device is used to measure miles?
What does a mile measure?

A cute way to introduce this activity to your class is by asking them questions concerning their measurements.

How big are you?

Are you bigger than the person sitting next to you?
Are your hands the same size or are they larger or smaller?
Are your feet the same size or are they larger or smaller?
Are you littler or bigger than the person sitting next to you?
Are you shorter or taller?

Explain to the children that they will be doing experiments on linear measurements. Explain that linear measurements are measurements taken along a line.

Begin the experiment by asking the children to count their steps beginning at their desks and going to a specified place such as the front step, etc. Stress the importance of remembering how many steps it takes: the last number he counts.

Now, ask each child to give the number of steps it takes for him to get outside. Compare the largest number with the smallest. Why is there such a difference?

Lead the children to the conclusion that foot size is the deciding factor in whether or not it took a few or many steps to reach the specified destination. Allow them to measure different foot sizes with a plain piece of cord or string. The children may also trace around their shoes or feet on a large piece of paper and compare sizes of different children's feet. An interesting classroom bulletin board could be made by having the children write their names on the paper feet they traced and arrange them from the largest to the smallest, etc. A fitting title for such a bulletin board might be "We Are This Big."

Next, try to discover whether or not there is correlation between foot size and body height. Measure two students (one short and one tall) by simply putting a narrow piece of paper from the floor to a reasonable height on the wall. Have the students stand against the marker and record their name at the appropriate height. The children can then see which of the two is the tallest and which is the shortest. Then, have the same two children compare their shoe or foot size. Who has the largest foot? Is the one with the largest foot the tallest or the shortest? The children should conclude that the tallest person has the larger foot showing that foot size and body height do correlate. Let the children experiment to see if hand size, head size, etc. also correlate with the height of a person.

After the children have become familiar with the terms inch, foot, yard, meter and/or mile, take them outdoors and let them measure natural objects. Some suggestions are as follows:

1. Length of a shadow of a building, tree, car, etc.
2. Width of a shadow of a building, tree, car, etc.
3. Width of a sidewalk
4. Length of a sidewalk
5. Width of a block
6. Length of a block
7. Width of a leaf
8. Length of a leaf
9. Length of a tree
10. Width of a tree
11. Height or width of various plants

Experiment with personal measurements:

1. Arms length
2. Arm span
3. Leg length
4. Height
5. Head measurement
6. Pace, etc.

From the conclusions made from previous activities, write a simple story problem and ask the students for a solution to it. An example is as follows.

John is five feet tall; Jane is four feet three inches tall. Which one is taller? Which one probably has the largest feet? Who has the smallest feet? Who would probably have to take the greatest number of steps to get across the room? Which one probably wears the biggest shoe? Why?