Curriculum Units by Fellows of the Yale-New Haven Teachers Institute
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Classroom Critters

Curriculum Unit 92.05.02
by Patricia Ansel

The main objective of this unit is to make science accessible to busy primary teachers with limited science knowledge. It is designed as a guide to successful care of plants and animals in the classroom.

As a primary level teacher with limited time and knowledge of science I've decided to approach the subject by introducing plants and animals, very small ones, to my classroom. In addition to their learning value, I believe they will make an important contribution to the aesthetic quality of the room. Further, they will be the focus for developing a sense of responsibility in the children as they assume responsibility for their care. As many students come from homes where they experience little nurturing themselves, I especially hope to stimulate those feelings in the children as they care for the plants and animals. By observing, doing and concluding, the students will learn how plants grow, how some animals live and about the interdependency of plants and animals. The visual richness and complexity of the aquarium and terrariums, self contained communities, provide many more opportunities for learning through observation and hands-on activities.

My unit objectives will be met by developing three ecosystems, an aquarium, a terrarium and a vivarium. Rabbits, guinea pigs and the like strike me as both limiting and overwhelming. Personally, I have concerns about the lessons we inadvertently teach when we have caged animals in the classroom. When we assume the care of an animal we must remember that they are dependent on us. We should ask ourselves whether we want to create a prison or a home for them. Consider the difference between putting two goldfish in a glass bowl devoid of plants and creating an ecosystem, a sophisticated, complex, natural environment. Animals are best kept under the supervision of a responsible adult so they do not fall prey to mishap. Animals that die for lack of proper care provide a lesson better not learned.

The time needed to complete the unit will be determined by the teacher and students as they gain confidence and are ready to move to the next challenge. Rushing is not recommended. Doing your homework up front will bring rewards, a manageable and successful science curriculum with healthy plants and animals.

AQUARIUMS

The three main types of aquariums depend on the fish you choose. They are, exotic or tropicals, native freshwater fish or saltwater fish. Our first ecosystem will be a tropical fish aquarium as it is the most manageable and the least expensive. To begin, you need patience and planning. There is much to do before you get the fish. Use the accompanying checklist to help plan your aquarium.

CHECKLIST OF MATERIALS FOR AN AQUARIUM

It would be a good idea to compare prices from two stores.

A 10-15 gallon tank “set-up” will include almost everything you need. Often they include a heater, dip tube, dip net, siphon, filter and pump.

Plants—6

Sand—10 lbs.

Light system

Cover (glass or plexiglass)

Fish—2 Guppies, 2 Swordtails and 1 Catfish

Food

TANK

Consider

- Temperatures fluctuate less in a large tank.
- The greater the water surface the more oxygen available to the fish and the easier it is for the carbon dioxide given off by the fish to escape.
- You will need space to add fish later.
- You need space for plants which will create an interdependency with the fish.

Solution

A 10 gallon rectangular or square glass tank meets all of these requirements. Important: curved glass becomes a lens that focuses sunlight and can literally cook the fish!

WATER

Consider

- It must be treated before filling the tank, tap water has chlorine and other chemicals.
- Water must not come into contact with metal.

Solution

- Age tap water in open glass jars for 4-5 days before filling the tank.

PLANTS

Plants most commonly used are Cabomba, Sagittaria and Vallisneria. Consider the size of the tank when buying. Young plants are best.

Consider

- They provide food and oxygen for the fish and absorb carbon dioxide and other waste given off by fish.
- Plants provide a natural background with hiding places for fish eggs and fry (baby fish).
- They retard the growth of algae.
- Plants need light to grow and give off oxygen, but too much sunlight will result in algae (ok for the fish but it makes the tank unattractive).

Solution

- Location of the tank is important.
- No direct sunlight on the tank.
- 1-2 hours of good light daily is enough.
- Artificial light will reduce the growth of algae (place it overhead about 6” away for 8-10 hours daily, use 60 watt bulb).

Setting up the aquarium means putting in the plants, sand and water. To plant the aquarium put 4-5” of water in the tank, wash the plants in running water to shake loose eggs and bacteria that might harm the fish. Set them in the tank in trays for easy removal when cleaning the tank or retrieving the fish. Place larger plants toward the back. Put them in groups separated by rocks and don’t bury the leaves. Use small pebbles around the base to let air circulate.

SAND

Use coarse white or #2 or #3 gravel 1-2” deep. Wash the sand by putting it in a pot or pail and turning the water on until it trickles over the side, loosen the sand and continue until the water runs clear. Place the sand at a slant 2” in back, 1” in front. This will help when you are cleaning the tank later.

FILLING THE TANK

Consider

- You don’t want to stir up the sand.

Solution

- Place paper or cardboard on the sand and pour the water onto it. Put water in with a sprinkling can (not metal) which is also good for aerating the water. Now let the tank sit for about a week.

THE FISH

There are three categories to consider: the live-bearers, the egg-layers and the bubble-nest builders. The live-bearers are inexpensive and the easiest of all the tropicals to keep. The three fish that are considered best for beginners are Guppies, Swordtails and Platyfish. It would be a good idea to get a Catfish too. You’ve exercised patience in preparing the tank and you’ll need it now! Those beautiful fish at the pet store are very tempting. Remember, you’re a beginner; keep it simple for success.

COMMON PROBLEMS AND SOLUTIONS

Problem: Algae build-up.
Solution: Remove tank from direct sunlight or put a piece of paper on the side of the tank hit by sunlight. Replace some of the water with cooler water.
Problem: Ich, a common ailment, white spots on the fin or a folded dorsal fin.
Solution: Fatal if not treated. 5 drops of 2% mercurochrome per gallon. 5-10 days to cure.
Problem: Fish are at the surface making a clucking sound as they gulp for air.

Solution: Remove some fish and aerate the water.

COMMON CAUSES OF SICKNESS IN FISH:

Incorrect water temperature (72-80 degrees for tropicals)

Chills

Overfeeding

Improper food

Overcrowding

Improper sunlight

Absence of oxygenating plants

Debris

Diseased fish

Dirty water

Shells or metal in the water

HELPFUL DO'S AND DON'TS

DO

- Use a tank with a slate or plastic bottom.
- Keep some aged water aside for emergencies.
- Put a thin pad such as a vinyl place mat under the tank.
- Carry the fish from the pet store in a thermos in cold weather.
- Put a glass jar with the new fish in the tank for 30 minutes before introducing the fish to the

tank.
- When using a cover, place 1/4” cork disks in the corners to allow air to circulate.

DON’T

- Do not move the tank with water inside.
- Avoid too many ornaments in the tank, food and debris will collect in the crevices and your tank will require more maintenance.
- Do not put the tank in a drafty area.
- Although it is tempting to put seashells in the tank, they will dissolve.
- Never use soap to clean the tank; it’s almost impossible to rinse off completely.
- Do not put wood in the tank, it will rot.

MAINTENANCE

Maintenance can be kept to a minimum if you follow the suggestions offered here. Daily examination for dead animals and correct water temperature are the first rules for caring for the aquarium. Siphoning will be necessary on a regular basis to keep the tank clean. A piece of rubber about 3/8 in diameter and 4 feet long makes a good syphon. Fill the tube with water and close both ends with your fingers. Dip one end in the aquarium and let the other end hang down in a pail which is lower than the aquarium. Remove both fingers from the ends of the tube and the water will run out of the tank into the pail. 1 Be sure to replace the water with fresh water that has sat out overnight (at least) to remove the chlorine. Evaporation will occur so you will need to replace lost water on a regular basis.

TERRARIUMS

The word terrarium means “a place of earth.” This may seem to be a modern concept when in fact, the art of Bonsai, keeping trees small by root cutting, is centuries old. Exotic fish raised in garden pools and indoors was a fine art in ancient China. Terrariums have become more popular as our cities grow larger. These miniature environments satisfy the desire to bring elements of nature inside our homes and workplaces.

The basic idea for terrariums as we know them was developed in 1829 by Dr. Nathaniel Ward.2 Unable to grow delicate bog ferns in his London garden, he successfully grew them in a laboratory jar where they were free of smoke and pollution. He discovered that plants would grow there unattended for years without adding water or air. Only the correct amount of light needed to be determined. Plant collecting became very popular, and collectors sought species from remote places. Most plants did not survive long journeys, succumbing to severe temperatures, lack of light and salt air. In 1832, Dr. Ward filled two glass containers with ferns and grasses and sent them to Australia. After seven months at sea, they arrived intact. Ten years later, Ward published a book telling of his ability to keep plants in a bottle without watering for 18 years. This was a boon to tea and rubber growers who now had a way to ship plants and to extend plantations throughout the globe. Wardian cases were widely accepted in Victorian homes. The idea that man could control nature was popular with people of that era also. In the past 100 years, although light admitting enclosures for living things have taken many forms, all fall under the general heading of terrariums. A Wardian case may be seen in New Haven in the conservatory at Edgerton Garden on Whitney Avenue.

Terrariums, like aquariums, can be seen as a art form. Consider the difference between putting a plant in a pot and creating an ecosystem, a sophisticated, complex natural environment. The latter provides opportunities for pleasure and learning. Regard it as another room because you’ll be using color, shape, space and light, all of which are elements of design.

An overview of the various types of environments in the world which can be created within a terrarium will demonstrate the range for creativity.3 This means making decisions and as you will see, the first decision will help determine the next and so on.

The first decision-climates for terrariums.

Types of environments

1. Tropical Rain Forest Floor

2. Tropical Rain Forest Floor: Halfway up the trees

3. Tropical Rain Forest Floor: The Treetops

4. North Temperate Forest

5. Semi-Desert: Sun

6. Semi-Desert: Shade

7. Bog or Swamp

8. Water and Bank

9. Cool Weather Type

10. Alpine

The second decision—an open or closed terrarium.

An open terrarium allows air to circulate and there is some loss of humidity. The perpetual rain cycle won't be present here so watering will be necessary. Openings which may be any size, provide access for trimming plants. A closed terrarium is for those climates which require high humidity such as a bog. A sealed terrarium has constant moisture because after the initial watering a natural rain cycle is established. The moisture is trapped and recycled indefinitely. Light is the plants source of energy and the soil provides nutriments. The cycle is complete and well defined. There are no variables. Light must be a constant daytime presence.

The third decision—animals. A vivarium = terrarium + animals.

Animals may best be left for the more experienced terrarium keeper. Responsibility for even the smallest of creatures is a major consideration. The goal here is to keep the environment in balance. Adding animals complicates the system especially if the system is small. If the system functions without needing cleaning, it is a successful partially functioning ecosystem because the plants, animals, light, water and decomposition processes are flourishing.

Elements of a terrarium. 4

1. Light
   The beginning of all related life processes. Ranges- sun or artificial, full sun to full shade, direct sun to filtered sun. Artificial light may be a good option.
2. Soil
   The foundation. Commercial mixes are available or mix one part sphagnum peat moss, one part perlite, one part vermiculite. To one quart of mixture add one tbsp. crushed eggshells. Add more sand for cacti and succulents; more loam for moss. 5 Moisture will determine the type of plants that grow. Humidity is important. Cacti need dry, sandy soil and air, bright sun and daytime warmth. Mosses need a moist, cool, low light environment.
3. Water
As we found when preparing the aquarium, chlorine and chemicals are present is tap water, let it stand overnight in an open glass container or use bottled water.
4. Temperature
   Range is 50-85 degrees for most terrarium plants. Plants need day/night cycle and seasonal rest.
5. Housekeeping
   The ideal terrarium is a complete ecosystem with the ability to attend to all the needs of life it contains.
6. Fertilizer
   It is possible to grow plants in a terrarium without fertilizer. If necessary, the proper time to use it is when the plant is doing well. A sick plant can't absorb and use fertilizer.
7. Containers
   If you want to think of a terrarium as art, any transparent glass that appeals to you will do.

Consider the openings. Don’t throw away those leaky aquariums accumulating in the basement. Garages and tag sales are good places to look for inexpensive containers, especially used aquarium tanks. Their size and opening make them ideal for terrarium planting.

8. Props

Rocks, wood, roots etc., may be included to add texture to the design of the environment. Be certain they are free of insecticide and disease.

I’ve chosen two ecosystems to develop for comparison; the first, the sunny semi-desert, an open terrarium without animals. Plants will include cacti and succulents. The second, a bog garden in a partially closed terrarium with a snail, newts, African frogs and water dogs.

Setting up a Semi-Desert: Sun Terrarium

1. Light: Bright sunlight or one 60 watt light for 10 hours per day.
2. Air: Circulation is very important, this is an open terrarium.
3. Soil: Sandy, 1 part humus to 10 parts coarse sand. Keep it moist in summer and dry in winter.
4. Water: Better to underwater than overwater, let soil dry between waterings. No standing water in this environment. Too much water is deadly for these plants. Use the finger method—poke into the soil, if it’s damp don’t add water. Don’t let the soil be dry for too long either.
5. Temperature: Not too hot.
6. Housekeeping: None.
7. Fertilizer: Liquid may be used.
8. Container: A 10-15 gallon aquarium tank.
9. Props: Rocks and twigs.
10. Animals: None.
11. Plants: The cactus family is huge. Cacti store water in thickened stems. Succulents store it in fleshy leaves. There are many interesting shapes to choose among. Suggested plants include

Gasteria, Aloe, Sedum, Astrophytum, Crassula, Adromischus, Lithops and Rebutia senilis. Thorns and coatings of white or bluish powder are natural sunscreens.6

Arrangements

Set the soil mixture about 3” deep toward the back, slightly shallower in front. Plant succulents in the clay pots they are purchased in where soil is 3” or more deep. This way, soil around the pots can be watered and it will be naturally absorbed into the pot and plants.

CHECKLIST OF MATERIALS NEEDED FOR SEMI—DESERT: SUN TERRARIUM

A 10 gallon aquarium tank

An artificial light system

Soil mix

Plants

Setting up the Bog or Swamp Terrarium

The addition of animals makes this a vivarium.

1. Light: Semi-shade, no direct sunlight on the glass. Keep it 2-3’ from the window with a northern exposure.
2. Air: Partially closed terrarium, a complete ecosystem.
3. Soil: Place a layer of 1/2” sized gravel covered with plastic screen. Cover with 1/2 to 1” mix of fine aquarium gravel and crushed, activated carbon. Cover all with matting of sphagnum moss 1-2” thick. Moss is odor free and manageable in a closed container. Use humus soil instead of moss in some areas for variety. All of these materials are available in a garden or aquarium supply store.
4. Water: Soil must be moist before closing the terrarium.

5. Temperature: Cool, 60 degrees at night—65 degrees in daytime.
6. Housekeeping: A well designed ecosystem requires none.
7. Fertilizer: none
8. Container: Bog Gardens need to be large, use a 10 gallon aquarium tank at least.
9. Props: In this damp environment, wood will rot. Use glass or plastic. Attractive stones add color and a sculptural effect.
10. Animals: Snails, water dogs, African frogs, and red newts are amphibians, a Greek word for "both life" meaning water and land. They love dampness. The latter two are recommended as the most manageable for beginners. They eat shrimp pellets, briny shrimp and crickets. They must be fed daily. Foods are available at pet stores.
11. Plants: The plants most appropriate are also the most ancient of plants. They predate the age of flowering plants- ferns, club mosses, mosses and selaginellas. Others are Sundew, bladderwort, cottongrass, rushes and certain lichens.

Arrangements

The wide variety of plants allow for a highly artistic terrarium. Place a thermometer where it can be seen easily. Make hills of cliffs and places for the animals to hide. Use a shallow dish filled with water in here too.

The Natural Rain Cycle

Water evaporates from the earth, oceans and smaller bodies of water, becoming water vapor in the atmosphere. When air becomes saturated, water condenses and returns to earth as rain or snow. In this terrarium, water vapor will evaporate from the damp, cool mosses. Condensation will form on the inside of the cover. When the drops are big enough it will rain in the terrarium, returning the water to the earth. The Bog or Swamp Terrarium we created is partially closed rather than closed so we can feed the animals. For this reason, there will be some loss of humidity. It's important to minimize the time that the cover is off so the rain cycle continues to function in an uninterrupted circular motion.

CHECKLIST OF MATERIALS NEEDED FOR VIVARIUM

A 10 gallon aquarium tank and cover

5 lbs 1/2” gravel

Activated carbon

Sphagnum moss

Glass stones

Thermometer

Lighting

Plants

Animals

Food

Loam

LESSON PLANS

Class Book

Goal To create a book about the classroom aquarium/terrarium. Objective: Students will use observational skills and art techniques to represent their impressions of fish and plants. Materials: White paper 8”x 10” and 3”x 5” for each student; diluted white glue and a glue stick; diluted tempera paint or ink, crayons, paint brushes, assorted colors of tissue paper, clear contac, brass brads or chrome rings, paper punch.

Procedure Discuss the things that are seen in the tank. Draw attention to shapes and sizes and relationships of plants and animals in terms of next to, in front of, etc.

1. Students will draw on 8”x 10” paper leaving the lower 3” blank for writing later.
2. They may apply tissue paper with diluted glue and a paint brush to add texture and interest.
3. A wash may be done over the drawing using diluted paint or ink.
4. Students will dictate or write a sentence on the 3”x 5” paper about their drawing. Use a glue stick to attach it to the bottom of their drawing.
5. Put two drawings back to back and laminate or cover with clear contact leaving 1/4” on the edges so it won’t separate.

6. Punch 3 holes on one edge.
7. Make a front and bank cover and compile all into a book using brads or rings to bind.
8. Read the book to the class, or each child could read his own page.

Aquarium/Terrarium Graph

Goal
To create a picture graph.

To create an abstract graph.

Objective
To represent 1:1 correspondence.

To discriminate between same and different.

To draw conclusions.

Materials
White paper 18”x 24” and 4”x 4”, crayons, “hot dots”

(stickers).

Picture graph

Procedure

1. Discuss with the students the things that are seen in the aquarium/terrarium. List their responses. Choose three things which can be counted.
2. At the top of the 18”x 24” white paper (on the 18” edge) write the names of the items to be counted for example; fish, plants and stones.
3. Under the word glue a picture (of a fish, etc). This is the heading of the graph.
4. As a whole group activity, ask one student to count the fish, a second to establish agreement. If the number is 7 assign 7 children to draw pictures of fish on the 4”x 4” paper (or cut pictures of fish from magazines and glue them on).
5. Continue this process with the other items.
6. With the whole group seated in front of the graph, ask one student at a time to put the fish picture on the graph, in a vertical row under the word “fish”.

7. Continue this process with the other items. Be certain to line the pictures up going from left to right-1 fish: 1 plant: 1 stone. This is necessary to establish a visual 1:1 correspondence.
8. Discussion of the graph is important, it may be left to a Language Arts lesson later in the day.

Abstract Graph

Procedure The following lesson should be the development of an abstract graph using the same information.

1. Set up the heading with the same pictures as the picture graph (fish, plants and stone).
2. As a group, count the fish pictures, choose that number of students to put a dot on the new graph in a vertical row under the fish.
3. Complete the graph. Be sure to line up the dots horizontally. This is extremely important to the graphing process.
4. Discuss the graph, encourage the students to draw conclusions such as more and less, how many altogether etc.
5. Grades 1 & 2 students may write sentences about the graph such as “There are seven fish.” A similar activity could be developed by graphing to record the number of gallons of water needed to fill the tank, the number of cups of sand, etc.

The BIG Tank

Goal
To create a three dimensional aquarium/ terrarium.

Objective
To look at forms of fish and plants.

Materials
White paper from a roll, paint, crayons, scrap construction paper, newspaper, glue, string and paper clips.

Procedure

1. Using two thicknesses of white paper about 2’ to 3’ long, cut a large simplified fish form. Do enough of these so everyone in the room has one. Students will be working in pairs.
2. Open the forms onto the table so it appears they are kissing. (To insure that both children are working on the outsides).
3. Students may design anyway they choose using the available materials.
4. Discuss whether or not partners should make their designs the same. Encourage discussion and decision-making by the partners.
5. When the fish are completed and dry, staple them together leaving an opening so it can be stuffed with crumpled newspaper. Staple shut.
6. Put a large knot at one end of a piece of string about a foot long. If your ceiling is made of acoustic tiles, push the corner of one up and insert the knot under it. Drop the tile into place. I leave a lot of these (of varying lengths) in the ceiling permanently with a paper clip attached to the other end so things can be hung up and taken down easily.
7. Hang the fish by punching a hole at the top and inserting into the paper clip.
8. Cut long strips of paper from the roll to look like the plant forms in the aquarium/terrarium. Paint or color them. Hang them from the ceiling among the fish. Styrofoam balls may be hung to look like carbon dioxide given off be the fish. Ask the students to determine whether or not a sun should be added. Kids just love this! They feel like they’re right in the tank. Extension: Students can write stories describing how it would feel to be a fish.

Notes

1. Alfred Morgan, *Aquarium Book for Boys and Girls* (New York, 1959), p.62.
2. Glen Lewis, *Terrariums, The World of Nature Under Glass* (Waukesha, 1973), pp. 23-24.
3. IBID., pp. 24-25.
4. John Hoke, *Terrariums* (New York, 1972), pp. 16-20.
5. Jack Kramer, *Gardens Under Glass* (New York, 1969), p. 15.
6. IBID., pp. 86-87.
7. IBID., p. 78.

BIBLIOGRAPHY

Gilbert, Miriam. *Starting An Aquarium* . Maplewood: G.S. Hammond & Co., 1961. Foreword by William Hillcourt, author of the Boy Scout Handbook. Very informative and practical.

Headstrom, Birger Richard. *Frogs, Toads and Salamanders as Pets* . New York: Ives Washburn, 1972. Everything you ever wanted to know about amphibians as residents of your terrarium.

Hoke, John. *Terrariums* . New York: Franklin Watts Inc., 1972. Good comprehensive overview of terrariums. Well organized for understanding ecosystems.

Kramer, Jack. *Gardens Under Glass* . New York: 1969. This book gives detailed instructions for beginners.

Lewis, Glen. *Terrariums; The World of Nature Under Glass* . Waukesha: Outdoor World, 1973. The author provides photos and drawings to illustrate a wide range of terrariums.

Mayland, Hans J. *The Complete Home Aquarium* . New York: Grosset & Dunlap 1976. This book is a bit technical but the chapter about plants is very useful and well illustrated.

Morgan, Alfred. *Aquarium Book for Boys and Girls* . 1959. One of a series by the author, this is a very clear guide to aquarium keeping.

K-2 STUDENT READING LIST

Brown, Margaret Wise. *The Fish With the Deep Sea Smile* . Linnet Book Shoe String Press., 1938. This author always present the best in children's books. This is another quality story.

Clemens, Andrew. *Big Al* . Picture Book Studio., 1988. Al becomes a hero when he and his friends get caught in a net.

Forman, Michael. *One World* . Little, Brown., 1991. The theme of the book is environmental awareness.

Heller, Ruth. *Chickens Aren't The Only Ones.* G.P. Putman., 1981. A colorful book about animals that lay eggs.

Hofman, Melita. *A Trip to the Pond* . Doubleday and Co., 1966. Beautifully illustrated, this would be an excellent resource for a field trip to the Whitney Water Center in New Haven.

Kalina, Sigmund. *The House That Nature Built* . Lothrop, Lee & Shepard Co., 1972. Beautifully illustrated with delicate line drawings and written in poetic prose, this book is a good source of vocabulary. It is a reminder or our responsibility to preserve the environment.

Leonni, Leo. *Fish is Fish* . Pantheon., 1970. This is about a tadpole who becomes a frog and his friend the fish.

Leonni, Leo. *The Biggest House in the World* . Pantheon., 1968 A young snail is looking for a bigger house.

Leonni, Leo. *Swimmy* . Pantheon., 1963. This is a favorite among the author's many books. It's about protection from predators, and the importance of a peer group.

Robbins, Ken. *A Flower Grows* . Dial Books for Young Readers., 1988. Black and white photographs are used to explain the life cycle of an amaryllis.

Russell, Helen Ross. *Water: A Field Trip Guide* . Little, Brown & Co., 1973. Very clear illustrations using black and white photographs to explain the presence of water everywhere in our lives.

Smith, F.C. *The First Book of Water* . Franklin Watts, Inc., 1959. The author presents good explanation of cycles and a comprehensive discussion of water related issues. Appropriate for grades 1 & 2.

Tresselt, Alvin. *Rain Drop Splash* . Lothrop, Lee & Shepard Co., 1946. This is a primary level approach to understanding the water cycle. The reader follows a drop of rain through the cycle.

Udrey, Janice. *A Tree is Nice* . Harper and Row., 1956. A gentle story about the joys of a tree.

TEACHER RESOURCES

Gardener, Robert. *Science in Your Backyard* . Simon & Schuster., 1987. There are a lot of science ideas illustrated with photographs and line drawings.

Kohl, Mary Ann and Candy Gainer. *Good Earth Art* . Bright Ring Publishing., 1991. There's a wealth of environmental art for kids here.

McCoy, Elin. *The Incredible Year-Round Play Book* . Random House., 1979. This treasure is chock full of do-able activities for outdoors using the elements.

Milford, Susan. *The Kids Nature Book* . Williamson Publishers., 1989. 365 indoor and outdoor activities and experiences are presented.

Coulombe, Deborah A. *The Seaside Naturalist* . Prentice Hall Press., 1984. Wonderful ideas for trips to the beach.

NEW HAVEN RESOURCES

Schooner, Inc. located at 60 Water Street in New Haven is an excellent resource. Call the Education Director at 865-1737. They offer a wide range of programs and will provide hands-on assistance for setting up aquariums. An alternative to the commercial aquariums developed in this unit is available through Schooner, Inc. The Long Island Sound Aquarium uses water and animals from the Sound. This is a great idea because it involves the local environment and animals. They offer assistance in setting up the aquarium and will provide the animals which they trawl for themselves. At the end of the school year you return the animals to Schooner and they will return them to the Sound. Inquire about the Short Term Tank—a 10 gallon tank you keep in the classroom with a new animal each week. This arrangement involves no feeding, and no pump. It could be an excellent introduction to aquarium keeping in general.

The Whitney Water Center at 915 Whitney Avenue in Hamden offers many educational programs appropriate for the K-2 level. There are guided walks through the woods as well as activities in the laboratory. They have a microscope connected to a VCR so everyone can see what's in the drop of water taken from the pond! The Education Director will show you how to set up a simple aquarium using a glass jar, an aquatic plant and a Guppy or two. This is an exciting alternative to the usual goldfish bowl. Call 777-1142.

Bottle Biology is a hands-on approach to science using plastic bottles to create experiments. It is appropriate for all levels and very inexpensive. Bottle Biology is funded by the National Science Foundation. The program is designed to develop instructional materials to promote the understanding of ecosystems, the environment and the scientific process. I highly recommend this as a place to start your exploration into science. This and the ideas from Schooner, Inc. and the Whitney Water Center would combine to be a fascinating and affordable preparation for this unit.

Write to:

Wisconsin Fast Plants & Bottles Biology

University of Wisconsin-Madison

Department of Plant Pathology

1630 Linden Drive

Madison, WI 53706