

Educators' Resource

Every Day is Earth Day K-10 Science Curriculum

Presented by

ANN NORTON SCULPTURE GARDENS

AND

KIDS ECOLOGY CORPS



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SCIENCE CURRICULA

- A. Pond Ecology-Grades K-3
- B. Pond Ecology-Grades 4-6
- C. Urban Jungle Explorers-Grades K-2
- D. Urban Jungle Explorers-Grades 3-5
- E. Plant Identification and Biodiversity-Grades 5-7
- F. Adventure Word Walk-Diversity-Grades 3-5
- G. Nature By Numbers-Biodiversity-Grades K-2
- H. Art Matters-Grades 1-4

Pond Ecology

Lesson Plan A

1st-3rd Grade

Summary:

Students will learn the unique features and adaptations of common macroinvertebrates and their feeding habits through a play acting a “Simon Says” type game format and a “Dip Netting” activity in the pond.

Objectives:

- To identify characteristics of a habitat and to identify the variety of habitats found in a single pond.
- To understand the lifecycle of a dragonfly
- To collect, observe, identify and classify the different macroinvertebrates (“mini-beasts”) that are found in or around a pond.
- To identify four classifications of mini-beasts based on their feeding habits: - shredders, collectors, scrapers (or grazers) and predators.

Benchmarks:

SC.1.L.14.1 Make observations of living things and their environment using the five senses

SC.1.L.17.1 Through observation, recognize that all plants and animals, including humans, need the basic necessities of air, water, food, and space.

SC.(1, 2, 3).N.1.1 Raise questions about the natural world, investigate them in teams through free exploration, and generate appropriate explanations based on those explorations.

SC.1.N.1.2 Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size, weight color and motion and compare their observations with others.

SC.(1).N.1.3 Keep records as appropriate-such as pictorial and written records-of investigations conducted

SC.1.P.8.1 Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light), texture, and whether objects sink or float.

SC.2.L.17.1 Compare and contrast the basic needs that all living things, including humans, have for survival.

SC.2.L.17.2 Recognize and explain that living things are found all over Earth, but each is only able to live in habitats that meet their basic needs.

SC. (2 and 3).N.1.2 Compare the observations made by different groups using the same tools

SC.2.N.1.5 Distinguish between empirical observation (what you see hear, feel, smell or taste) and ideas or inferences (what you think)

SC.3.L.15.1 Classify animals into major groups (mammals, birds, reptiles, amphibians, fish, arthropods, vertebrates and invertebrates, those having live births and those which lay eggs) according to their physical characteristics and behaviors.

SC.3.N.1.3 Keep records as appropriate, such as pictorial, written, or simple charts and graphs, of investigations conducted

Materials:

- Shallow pans, such as dish pans, for each group
- Ladles, scoops, spoons, eyedroppers to use in transferring samples to smaller containers

- Small containers to separate the samples for study (e.g. baby food jars, Petri dishes, ice cube trays, etc.)
- Hand lenses
- Rulers
- Macroinvertebrate Identification Field Guide
- Paper or notebooks, pencils, crayons
- Alternative book resources for identifying animals that are not pictured on the identification sheet.
- Pond Life Field Guide

Prior Knowledge:

- Know how to count up to 50
- Know how to use a ruler
- Know how to make observations using the 5 senses

Teaching Procedures:

1. Participate in a guided tour of the Ann Norton Sculpture Gardens ending at the north pond.
2. Using visual aids explain that “land creatures” are ruled by a big cycle of events we call the food chain and the pond is also ruled by the food chain. The first stage of the pond food chain is microorganisms: algae, plankton, and microscopic plants. In the second stage of the cycle, insects such as flies, bugs, and worms feed upon the microorganisms. In the third stage of the aquatic life cycle, fish devour the plants and animals from the first and second stages of the food chain. The total ecological balance of the pond relies on this chain. If this chain is broken, disaster occurs in the form on pollutants that can kill the animals and plants.
3. Activate prior knowledge. Ask the students if they know what observation means and how do they observe something. Ask the students to identify their senses. Observation occurs when we see, hear, feel, taste or smell.
4. Tell students we are going to play a game called “What is in Ann’s habitat?” Tell students what that a habitat is a place where plants and animals live. Each group will have to record as many sight and sound observations in the habitat as possible. *Note for younger students you can hide objects for them to find and observe with their magnifying glasses.
5. Discuss briefly the pond habitat. Ask students what types of animals that we find pond habitats? Ask students what types of plants they would find? Discuss how habitats are places that can sustain life by offering food, water and shelter.
6. Discuss with students how pond habitats are made up of five different areas-the pond bottom, surface, mid-water, above the surface and pond margin using a felt board visual aid. Using Animal and Plant cut outs, discuss where we would expect to find different species of animals and plants while students attach them to the felt board.
7. Discuss that the pond is home to a number of macroinvertebrates “mini-beasts”-small animals living in water including many types of insects such as dragon flies and damsel flies as well as other animals such as worms, mollusks and tiny crustaceans. Live samples are passed around for students to touch.

8. Read with students Dragonfly-A Life Cycle Story. Then discuss the life cycle of a Dragonfly using a large visual aid. Discuss that Dragonflies start their lives as eggs, usually laid in the water. These eggs hatch into free swimming larva, sometimes called nymphs, which feed primarily on bloodworms and other aquatic larvae. These nymphs will go through several stages of development, shedding its skin as it grows, until at last (several weeks to several years later, depending on the species) it moults a last time and emerges from the water as an adult dragonfly. The adults eat mostly smaller flying insects, like midges and mosquitoes. Some of the larger species will even eat smaller dragonflies. Ask students “how big do dragonflies get?” Tell students that dragon flies usually don’t get larger than 7 ½ inches in wingspan, but prehistoric dragonflies were as big as two and half feet. Ask students to dragonflies bite? Tell students that even though dragonflies can be big but they don’t bite or sting. Even though their tale looks like a stinger, that they only use it for laying eggs.
9. Discuss with students how macroinvertebrates are classified into four groups depending on their feeding habits: Shredders, Collectors, Scrapers and Predators.
10. Divide students up into 6 groups: Dragonflies, Craneflies, Blackflies, Mayflies, Stoneflies and Caddisflies. Explain the different feeding habits of each group and assign them an action:
 - a. Dragonflies are predators; they have long mouthparts that extent to catch prey. For their action, have the students put their hands to their mouths with their elbows tucked down in front of them. To mimic eating, have the students straighten their elbows and make an upward scooping action
 - b. Craneflies are collectors. They wiggle around until they find a place to feed. The action should be like a wiggly walk.
 - c. Blackflies are also collectors, but they collect with a large net like feature on their head which they use to gather food. They can lower it down to their mouths to eat. The action should be placing your hands above your head and lowering them down to your mouth
 - d. Stoneflies are shredders. They wait for leaves or other debris to fall in to the water, then they tear off small pieces to eat. The action should be similar to tearing up a piece of paper.
 - e. Caddisflies and Mayflies are scrapers they scrape algae off of rocks and sticks. Their action should be similar to scratching someones back
11. After each group has learned their action, have them act out their part at the same time for one minute. Remember to set boundaries.
12. Test students on all types of feeding habits by playing “Simon Says”. (Example: Simon says act like a blackfly. Action: Everyone’s hands should go above their head)
13. Distribute macroinvertebrate identification sheets to each student.
14. Discuss safety procedures including how close students are allowed to the pond and not to touch with their hands the mini-beasts, plants, etc. they collect in their dip nets.
15. Distribute packets to students and explain how to record their observations.
16. Demonstrate for students how to collect water from the pond and using a dip net to collect animal and plant life. Gather students around for an initial “gross examination”.
17. Divide students into groups of 2-3 and distribute supplies.

18. Assist students with how to observe collected samples, using magnification e.g. magnifying glasses, etc., identifying and classifying organisms
19. Give students time to browse through additional resources and see if they can identify specimens that are not on the list
20. Gather students and discuss the types of mini-beasts they found. Discuss the variety of species students observed and highlight adaptations of the different types of mini-beasts. Encourage students to show each other the mini-beasts they found and share their observations.
21. Return mini-beast samples to the pond and gather materials.

Indicators of Success, student will...

- Know how to use magnification
- Classify macroinvertebrates using a identification guide
- Identify and know at least two different types of macroinvertebrates
- Know the life cycle of a damselfly
- Students will understand the pond food chain
- Students will be able to identify at least 2 different habitats in the garden
- Students will know that macroinvertebrates are classified into different groups determined by their feeding habits

Extension:

- Discuss how pollution affects macroinvertebrates and their habitat.

Pond Ecology
Lesson Plan B
Grades 4-6

Objective:

Students will explore the Ann Norton Sculpture Garden water ponds and conduct fieldwork to determine water quality of these freshwater habitats.

Benchmarks:

SC.4.L.17.2 Explain that animals, including humans, cannot make their own food and that when animals eat plants or other animals, the energy stored in the food source is passed to them.

SC.4.L.17.3 Trace the flow of energy from the Sun as it is transferred along the food chain through the producers to the consumers.

SC.4.L.17.4 Recognize ways plants and animals, including humans, can impact the environment.

SC.(4 and 5).N.1.1 Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

SC.4.N.1.2 Compare the observations made by different groups using multiple tools and seek reasons to explain the differences across groups.

SC.6.L.15.1 Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnean system combined with the concept of domains

SC.6.N.1.1 Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understandin, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables and graphics, analyze information, make predictions, and defend conclusions.

SC.6.N.1.4 Discuss, compare, and negotiate methods used, results observed and explanations among groups of students conducting the same investigation

SC.6.L.14.3 Recognize and explore how cells of all organisms undergo similar processes to maintain homeostasis, including extracting energy from food, getting rid of waste and reproducing

Materials:

- field guides of pond life or freshwater life
- variety of small nets

- white collecting buckets
- pH paper
- thermometers, preferably without mercury
- meter sticks or tape measures
- fish floats, leaves, or any objects that will float
- magnifying glasses or bug boxes

Procedures:

1. Using visual aids explain that “land creatures” are ruled by a big cycle of events we call the food chain and that “pond creatures” are also ruled by the food chain. The first stage of the pond food chain is the microorganism of algae, plankton, and microscopic plants. Insects such as flies, bugs, and worms feed upon these substances. Fish then devour the plants and animals from the first and second stages of the food chain. The total ecological balance of the pond relies on this chain. If this chain is broken, disaster occurs in the form on pollutants that can kill the animals and plants.
2. Explain that scientists consider freshwater habitats to have salinity, or saltwater content, of less than .005 percent. Freshwater habitats are ponds, lakes, bogs, rivers, streams, creeks, marshes, swamps, or even puddles and drainage ditches. A reservoir is an artificial freshwater resource.
3. Brainstorm with students a list of freshwater habitats close to their home or school. Ask students to hypothesize about the health of a nearby habitat and its diversity of life. Would students consider it healthy or unhealthy? Why? Explain that some organisms can tolerate a polluted freshwater environment. Discuss with students why the garden has a pond. Ask students to hypothesize about the role the pond plays in the gardens ecosystem.
4. Introduce the word "macroinvertebrate" to the group. Explain that macroinvertebrates are animals without a backbone living in one stage of its life cycle, usually the nymph or larval stage. Macroinvertebrates are visible without using a microscope. They can spend a few years living in a freshwater habitat and many are benthic organisms, or bottom dwellers. Ask students to hypothesize what would happen to the animals if the ponds were filled in with dirt.
5. Explain that scientists determine a freshwater habitat's health by the number and type of its organisms. The water quality of such a habitat is good when it is rich in oxygen and supports a variety of organisms. Water quality is fair when it has less oxygen and low levels of pollutants, and poor when it has high levels of pollutants. Some organisms can survive only in freshwater of good quality, while others can live in any quality.
6. Review with the group a chart of macroinvertebrates and the quality of water their presence indicates. For example the presence of stonefly larvae indicates good water quality because they are highly sensitive to chemical and physical changes. But leeches can live in any water, so their presence may indicate poor quality.

Good water quality	Fair water quality	Poor water quality
Mayfly larvae	Dragonfly nymph	Aquatic worms
Stonefly larvae	Cranefly larvae	Leech
Caddisfly larvae	Damselfly larvae	Snail
Dobsonfly larvae		Midge fly larvae
Water penny		Blackfly larvae
Beetle		

7. Divide students into teams of two. Explain to the group that they will study two different freshwater habitats. Explain the types of data that students will be collecting including types and number of macroinvertebrates identified.
8. Review safety precautions to follow during fieldwork: do not enter the water, remember wet surfaces, such as rocks with algae, are slippery.
9. Have each team gather equipment and choose a place to work in one of the two habitats. Have students observe the water's edge and surface, and look through the water to the bottom of the habitat. Have the students record their observations on a data sheet.
10. Have students measure the water temperature with a thermometer and record depth with a meter stick. Measure the water's pH with pH paper. They should record all data on their data sheets.
11. Have students move their nets through the pond habitat and then dislodge organisms by disturbing the pond bottom and rubbing rock surfaces. Students will raise their nets and gently put organisms into a bucket. In still water, students must carefully sift through mud or sand in the net. Gather students together so that they can observe each others findings. Discuss with students why each group observed different macroinvertebrates. Ask different groups to present their findings to the group. Determine as a group if the pond habitat has good, fair or poor water quality. Ask students why they are different or the same? Ask how their two pond habitats are different and/or same. Students should handle organisms gently; be aware that some organisms can bite or pinch; never drink the water, identify and count the organisms, record their data and return them to the habitat alive.

Indicators of Success:

- List 3 differences between the two habitats
- Define if the water quality of the habitats is good, fair or poor and explain why.
- Explain the food chain for land creatures and pond creatures.
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Extension:

- Have student's research human impacts on the quality of freshwater habitats. Have student hypothesize the impact of run-off might have on a freshwater habitat.

Urban Jungle Explorers

Lesson Plan C

Grades K-2

Objective:

Students will pretend they are explorers in the Ann Norton Sculpture Garden Urban Jungle. Students will use their senses to explore and discover a great variety of plant and animal species in the garden.

Benchmarks:

SC.1.L.14.1 Make observations of living things and their environment using the five senses.

SC.1.N.1.2 Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size weight, color and motion and compare their observations with others

SC.1.N.1.3 Keep records as appropriate-such as pictorial and written records of investigations conducted.

SC.2.N.1.2 Compare the observations made by different groups using the same tools.

SC.2.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explanations.

Materials:

- Ann Norton Guide to Native and Non-Native Plants and Palms
- Magnifying glass
- Palm Tree Bingo Cards
- Palm Stickers to put on Palm Tree Bingo Cards
- Rewards for Bingo Card winners
- Large Demonstration Scale
- 10 wood objects
- Water Cycle visual aid
- Plant Trees Sturdy for the Birdies Exhibit

Prior Knowledge:

- Identify the 5 senses
- Verbalize identification of shapes
- Verbalize identification of textures
- Verbalize identification of sounds
- Verbalize identification of smells

Indicators of Success, student can...

- Identify at least 3 plant species by common name
- Identify at least 3 animal species by common name
- Explain how people impact urban forests
- Explain why it is important to protect imperiled plant and tree species

Teaching Procedures:

1. Tour the Ann Norton Sculpture Garden and get the history
2. Meet in the Ann Norton's House
3. Ask students what does the word ecology mean? Discuss with students that ecology is the study of the environment, our home. But ecology is more than a science. It is about our relationship with the earth. The health and well being of both humans and wildlife are dependent upon the quality of our natural environment. All forms of life are interdependent. For example: each of you depends on your parents to take care of you...buy food and shelter. Just like you need food and shelter so do plants and trees.
4. Using a scale play a game with students to discuss the idea of environmental balance. Each object placed on the scale represents a type of pollution or action such as recycling. Discuss balance in the context that if one side gets too heavy as we use too many of our natural resources in an unsustainable way, then the scale tips to one side or becomes unbalanced.
5. Ask students to think about cities and their towns. Ask students if they think their towns are out of balance. Ask students what they think they could do to restore balance in their neighborhood and cities.
6. Tell students that one way to restore balance is to plant trees and palms. Discuss with students what trees do for the environment such as: clean the air, keep our earth cool, act as wind break, clean our water, reduce storm runoff and protect against topsoil erosion, provide habitat for native wildlife and migrating birds, food for humans, increase property values and add beauty to the landscape, contribute to community pride and peace and finally without trees there wouldn't be humans.
7. Ask students if they think a palm is a tree. Discuss with students that a palm is not a tree but a type of plant that is more closely related to grasses and orchids. Discuss the morphology of a palm using a visual with students
8. Divide students into as many groups as there are chaparones to explore the garden and identify at least 5 different palms and 5 different animals. Students will also describe what they find in the context of shape, color, texture, sound, etc.
9. Gather students in the courtyard so that they can discuss what they found on their expedition. Tell students that they can create a habitat in their yard. Explain that like Ann's garden they can also plant a garden of their own. Discuss backyard habitats and distribute how to plant your backyard habitat to students. Distribute Plant Trees Sturdy for the Birdies video and teacher guide to teachers for use in their classroom.
10. Thank teachers and students for visiting the Ann Norton Sculpture Garden

Extension:

- Have students go to their schools computer lab and library to research and learn more about the 5 palm trees and 5 animals that they identified in the garden.
- Have students research the human impacts in more detail and come up with ways to lessen their impact. Challenge students to plan their own eco-action projects in the community.

Urban Jungle Explorers

Lesson Plan A

Grades 3-5

Objective:

Students will explore the Ann Norton Sculpture Garden Urban Jungle to learn about the great variety of plants and trees found in this urban forest. Students will also learn about Ann's vision of the garden and why she planted such diverse species in the garden. Students will also learn how people impact the urban forest and how students can enhance and preserve habitats in their communities.

Benchmarks:

SC.(3 and 4).N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.(3 and 4).N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

SC.3.N.1.3 Keep records as appropriate, such as pictorial, written or simple charts and graphs of investigations conducted.

SC.4.N.1.6 Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.

SC.5.L.15.1 Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

Materials:

- Ann Norton Guide to Native and Non-Native Plants and Palms
- Magnifying glass
- Palm Tree Bingo Cards
- Palm Stickers to put on Palm Tree Bingo Cards
- Rewards for Bingo Card winners
- Large Demonstration Scale
- 10 wood objects
- Water Cycle visual aid
- Plant Trees Sturdy for the Birdies Exhibit

Indicators of Success, student can...

- Understand why Ann Norton decided to create a diverse garden of native and non-native palm species
- Explain the importance and benefits of plants and trees in the water cycle
- Identify at least 5 palms by common name

- Explain how people impact urban forests
- Explain the difference between native and non-native species
- Explain why it is important to protect imperiled plant and tree species

Teaching Procedures:

1. Tour the Ann Norton Sculpture Garden and get the history
2. Meet in the Ann Norton's House
3. Ask students what does the word ecology mean? Discuss with students that ecology is the study of the environment, our home. But ecology is more than a science. It is about our relationship with the earth. The health and well being of both humans and wildlife are dependent upon the quality of our natural environment. All forms of life are interdependent. For example: each of you depends on your parents to take care of you...buy food, clothes and a home. Just like you need food and shelter so do plants and trees.
4. Using a scale play a game with students to discuss the idea of environmental balance. Each object placed on the scale represents a type of pollution or action such as recycling. Discuss balance in the context that if one side gets too heavy as we use too many of our natural resources in an unsustainable way, then the scale tips to one side or becomes unbalanced.
5. Ask students to think about cities and their towns. Ask students if they think their towns are out of balance. Ask students what they think they could do to restore balance in their neighborhood and cities.
6. Tell students that one way to restore balance is to plant trees and palms. Discuss with students what trees do for the environment such as: clean the air, keep our earth cool, act as wind break, clean our water, reduce storm runoff and protect against topsoil erosion, provide habitat for native wildlife and migrating birds, food for humans, increase property values and add beauty to the landscape, contribute to community pride and peace and finally without trees there wouldn't be humans.
7. Discuss with students that trees drive the water cycle. Using a visual aid review the water cycle. Ask students what they think would happen if we cut down all of the trees in South Florida.
8. Ask students if they think a palm is a tree. Discuss with students that a palm is not a tree but a type of plant that is more closely related to grasses and orchids. Discuss the morphology of a palm using a visual with students
9. Explore the garden with students and play a game of Bingo while identifying native and non-native palms. Discuss with students unique features of palms in the garden and their uses by Native Americans and modern society.
10. Divide students into as many groups as there are chaparones to explore the garden and identify at least 10 different palms and record their scientific name, common name, origin and unique features.
11. Gather students in the courtyard so that they can discuss what they found on their expedition. Tell students that they can create a habitat in their yard. Explain that like Ann's garden they can also plant a garden of their own. Discuss backyard habitats and distribute how to plant your backyard habitat to students. Distribute Plant Trees Sturdy for the Birdies video and teacher guide to teachers for use in their classroom.

Extension:

- Have students go to their schools computer lab and library to research and learn more about the 10 palm trees that they identified in the garden.

- Have students research the human impacts in more detail and come up with ways to lessen their impact. Challenge students to plan their own eco-action projects in the community.

Scavenger Hike-Diversity

Lesson Plan E

Grades 5-7

Objective:

Students search for plants with particular characteristics. A combination of words and/or drawings may be used for clues. This activity works well to reinforce identification characteristics and features and the associated vocabulary.

Benchmarks:

SC.5.L.15.1 Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

SC.5.L.14.2 Compare and contrast the function of organs and other physical structures of plants and animals, including humans, for example: some animals have skeletons for support -- some with internal skeletons others with exoskeletons -- while some plants have stems for support.

SC.5.L.15.1 Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

SC.6.L.15.1 Analyze and describe how and why organisms are classified according to shared characteristics with emphasis on the Linnaean system combined with the concept of Domains.

SC.7.L.15.3 Explore the scientific theory of evolution by recognizing and explaining ways in which genetic variation and environmental factors contribute to evolution by natural selection and diversity of organisms

SC.7.L.17.2 Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition and commensalism.

SC.7.L.17.3 Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease parasitism, predation, and nesting sites.

Materials:

- Plant and tree identification guide
- Plant features guide
- Pencils
- Access to varied plants in a garden or natural setting.

Teacher Procedures:

1. Discuss the basis of the study of biodiversity is being able to tell one species apart from another and know its name - taxonomy. Identifying plants can seem overwhelming at first, but each species is defined by its own unique characteristics
2. Discuss how as we improve our observation skills, recognizing different plant species becomes almost as easy as recognizing different people. It isn't just a matter of looking at their hair color or shape of face.
3. Plants are the same; it's not just about the flower. It's also a combination of leaf shape and arrangement, texture, size and color, combined with where the plant is growing. We just have to learn to "see" these things.
4. In order to describe different species to each other, scientists use very precise language to talk about their characteristic features. These technical terms are an important part of the study of plant taxonomy.
5. We're going on a walk to look for some specific plant features, students may work alone or in pairs.
6. Discuss the activity: Find plants with each of these features. Don't pick the plants; just make a mark to show that you've found them. If you'd like to show a plant to someone, take him or her to the plant - don't take the plant to them.

- | | |
|---|---------------------|
| • Pinate leaf | • Palmate leaf |
| • Inflorescence (the part of a palm that the flower comes out of) | • Palm Stem |
| • Yellow flower | • Spines |
| • Palm seeds | • Head |
| • Palm fruit | • Rachis |
| • Thorns | • Bipinnate leaf |
| • Palm flower | • Costapalmate leaf |

7. Gather the group around and sit in one area and ask how many examples of a particular feature they can see from where they are. Do their eyes "see" plant features more easily after some practice?
8. Compare lists - were certain features easier/harder to find? Would they be easier to find at a different time of year?
9. You could go back along the route and ID some of the plants with field guides (use field guides for older students or have customized mini-guides with photos for younger children).
10. Gather students back at seating area. Lead into a discussion about plant diversity and the variety of palm features they found in the Ann Norton Sculpture Garden. Using a visual aid define and then explain what diversity is using examples. Ask is there high or low diversity in Ann's garden? Which sorts of habitats may have low plant diversity, which may have high plant diversity? Why?

Extension:

- Have students grow native palms from seeds that they can care for on campus and then plant for an eco-action project
- Build a 3-dimensional plant model

Adventure Word Walk-DIVERSITY

Lesson Plan F
Grades 3-5

Objective:

Students will take an Adventure Word Walk through the Ann Norton Sculpture Garden where hidden letters will be revealed and small activities are done. Once the hike is finished the jumbled letters can be pieced together to spell the single word “DIVERSITY”.

Materials:

- Letters printed or hand drawn on cardstock and laminated to prevent damage from the rain, with a corresponding word printed on the back.
- Examples of different seed types (see “R – range” activity)

Benchmarks:

SC.(3 and 4).N.1.1 Raise questions about the natural world, investigate them individually and in teams through free exploration and systematic investigations, and generate appropriate explanations based on those explorations.

SC.(3 and 4).N.1.2 Compare the observations made by different groups using the same tools and seek reasons to explain the differences across groups.

SC.3.N.1.3 Keep records as appropriate, such as pictorial, written or simple charts and graphs of investigations conducted.

SC.4.N.1.6 Keep records that describe observations made, carefully distinguishing actual observations from ideas and inferences about the observations.

SC.5.L.15.1 Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

SC.5.L.15.1 Describe how, when the environment changes, differences between individuals allow some plants and animals to survive and reproduce while others die or move to new locations.

SC.5.L.17.1 Compare and contrast adaptations displayed by animals and plants that enable them to survive in different environments such as life cycles variations, animal behaviors and physical characteristics.

Teaching Procedures:

1. Welcome the group to the Adventure Word Walk. Explain that they will be given a walking tour of one of the most interesting parts of the Ann Norton Sculpture Garden, and while they are on the trail, they should be looking for letters that look like this (show example), hidden along the trail. When the walk is done and the letters are all collected, they will spell a word.
2. Set up a rotating leader who will walk first along the trail (this can also be done in pairs). Once the first person or pair has found a letter, they go to the back of the line

and let the next person/pair lead. The word offered here is Diversity, which at nine letters, means nine stops. Obviously you as the leader will have to hide the letters prior to the group's arrival. Be sure to mix up the order. Hiding them in the same place each time will help you remember where they all are, and prevent a whole group from passing one too well hidden. In an exercise like this, don't be afraid to play the clown a bit, or to keep things moving along- even if it means not debriefing every activity. The student's should be kept interested, and a quick pace (though not rushed), can help that.

D – Delicate. Have the group go out with supervision and find the most delicate plant they can find. When they've found one, mark it and show a friend.

I – Interconnections. Have the group look around the area of the letter for evidence that a plant is connected to something else (for those students having difficulty, encourage them to think about how oxygen is made- thus every plant is connected to us. Other options are insect chewing, photosynthesis, plants taking up water and nutrients from the soil by their roots)

V – Variety. Select a site with lots of species in it to hide this letter. Give the group 30seconds to count as many different kinds of plants they can find. When the time is up, have the group circle up and ask (with a show of hands) who found 1 kind of plant? 2? 3? And so on, as high as you can go.

E – Energy. Ask the group how plants get their energy. Right, the sun. Ask the group to squish themselves into a tight, standing bunch. Ok, now, if you were all plants (and your feet are your roots, so you can't move them), and your whole bodies can make energy from the sun, how would you try to get the most sun you could? After the laughter has died down, get the group to step back and ask them- what kind of group of plants looks like you just did (forests, tall fields). Now ask them to spread out all around- and with part of your feet touching the ground (roots), how would you place your plant self to get the most sun now? Have everyone look around. Bring the group back and ask where plants look like they just did (the understory of a forest, or shady place).

R – Range. This is a spin-off from Simon Says. It's called 'Simon Says Seeds...' Get the group into four big huddled bunches. Tell them they are bunches of seeds in a seed pod. And each seed pod has a different way of spreading their seeds. Walk up to the first group and say, "Simon says seeds in this plant take two steps from their pod. These seeds have dropped off their mother plant." Walk over to the next bunch and say "Simon says seeds from this plant are about to be popped right out of their pod! Take 5 safe, fast steps away from the pod, Now!" Now walk to the third group and say, "Simon says seeds from this plant have little parachutes on them and the wind has just picked them up! Take ten twirling steps in any way the wind blows you". Finally, walk up to the last group and say, "Simon says seeds from this plant have been eaten by a Florida Black Bear. Take 20 giant steps away from the mother plant. Ask everyone to take a good look at all the seeds. Ask- which plants will have a bigger territory? Which ones will have a smaller territory? What might happen if (walk over to the first group), this whole group of babies were dug up to make a new subdivision?

S – Scale. Tell the group that we big tromping humans see things on a human scale for example trees look big and bugs look small. But what if we were a bug? Get the group to make a spy-glass out of their forefinger and thumb and say this is your bug's eye view. Ask them to go out and find one amazing thing about a plant that fits into your bug's eye view (encourage them to get close, by kneeling down to find your own view). When they find something, have them show a friend.

I – Interesting. Have the group go off on their own and take 3 minutes to find the most interesting thing they can about a plant. Show it to a partner.

T – Territory. Most plants can't travel very far or very fast. In fact, if you are a plant, you can't move at all. Imagine if you could never pick up your feet again! Give the class a chance to decide what (within given boundaries), they would consider the perfect place to be and never move from. Invite the students to find a spot, and give them a chance to check out their new home. If it suits the group, you could run this as a solo spot, inviting students to sit or stand quietly, like a plant for a few minutes.

Y – Yummy. Hide this letter in a place where there are tasting options for the group. These could be seasonally dependant (berries in late spring/summer/early fall), or traditional stand-bys like evergreens. Be sure to have children who are highly allergic abstain from tasting- but do encourage them to smell, or use another sense.

3. Bring the group back to a central space and lay all the letters out. Give the group free reign to brainstorm and move the letters around to hopefully, create the word Diversity. Ask for someone to tell the group what they think diversity means. Then ask the group what other things they learned about what diversity is from today's walk.
4. Discuss with students why they think that Ann Norton decided to plant such a garden with such diversity. Why didn't she just plant all native plant species? What was her goal?
5. Gather students in the courtyard so that they can discuss what they found on their expedition. Tell students that they can create a habitat in their yard. Explain that like Ann's garden they can also plant a garden of their own. Discuss backyard habitats and distribute how to plant your backyard habitat to students. Distribute Plant Trees Sturdy for the Birdies video and teacher guide to teachers for use in their classroom.

Extensions:

- This activity can be done with any word- the emphasis being on creating fun and simple experiences and activities that give students an opportunity to explore the natural world with their own senses. Shorter words can be used.
- Back in the classroom, the class could make their own word walk to run for a younger class.

Nature by Numbers (Biodiversity)

Lesson Plan G

Grades K-2

Objective:

Students will explore nature and the concept of numbers that underlies the wonder of diversity of different plants and trees in the Ann Norton Sculpture Garden

Materials:

- Small sheets of paper for the children to mark numbers from 1-20 (or more)
- Pencils
- Clipboards

Benchmarks:

SC.1.L.14.1 Make observations of living things and their environment using the five senses

SC.1.N.1.2 Using the five senses as tools, make careful observations, describe objects in terms of number, shape, texture, size weight, color and motion and compare their observations with others

SC.1.N.1.3 Keep records as appropriate-such as pictorial and written records of investigations conducted.

SC.2.N.1.2 Compare the observations made by different groups using the same tools.

SC.2.N.1.1 Raise questions about the natural world, investigate them in teams through free exploration and systematic observations, and generate appropriate explanations based on those explanations.

Teaching Procedure:

1. Guide the class to the main entrance of the garden where there is a diversity of plants/habitats
2. Suggest to the students that plants have numbers hidden in them everywhere- ask the students where they might find things in sets of 2
3. Ensure the class knows they are looking for natural things occurring in pairs or triplets, etc, not the actual number plants in the garden.
4. Present the activity as a kind of scavenger hunt for the hidden numbers and patterns in nature, starting at the number 1 and counting as high as they can find.
5. Encourage the students to write the name of, or draw a small picture of the found item representing each number. Teacher and parents can also assist students
6. Set boundaries for the activity. Have the teacher of the class put the students into pairs and assign 2 or 3 sets of pairs go searching with a parent volunteer or their teacher
7. Give the groups as much time as they need to have discovered at least 5 to 10 items
8. Bring the class back into a seated (or standing) circle
9. Ask all the pairs who found something occurring singly to raise their hands (hopefully, all will do so). Get a few pairs to share what they found, asking "Who else found that too?" Continue this as high as you can go.
10. If the group is still engaged, ask individuals, which was their favourite plant? Why? What surprised them about their search for numbers? Encourage even the quieter kids to share what they liked. When time is up, or stories have run out, congratulate everyone for doing a great job
11. Consider pointing out that the garden makes sure to have lots of different kinds of plants, and with so many kinds of plants, we can be sure to find all kinds of patterns just like nature does in the wild.

12. Next pair students into groups of two. Have one person close their eyes or put on a blindfold. The other partner will pick a plant they can see and describe it in as much detail as possible to their partner. The partner then opens their eyes and tries to find the plant their partner described. Switch roles then repeat.
13. Return to the circle area for students to share their experiences and what sorts of descriptions made it easier to find the plant. Ask students what type of descriptions were not very helpful and which ones were very helpful.
14. Discuss how having a common understanding of the terms used to describe plants is helpful e.g. the difference between a hairy leaf and a soft leaf.
15. Lead into a discussion about plant diversity and the variety of plants and palms found in the Ann Norton Sculpture Garden. Using a visual aid define and then explain what diversity is using examples. Ask is there high or low diversity in Ann's garden? Which sorts of habitats may have low plant diversity, which may have high plant diversity? Why?

Extensions:

- Back in the classroom, consider doing math sums with pictures of some of the plants found
- During a math period, bring the class out to the grassy playing field to repeat the activity. Have the children compare how easy it was to find numbers in their schoolyard than at the Ann Norton Sculpture Garden. Have the students make suggestions as to why it might be more difficult (fewer types of plants to choose from).

Source: Diane Lawrence, Faculty of Education, Queen's University

Art Matters

Lesson Plan H

Grades 1-4

Objectives: Students will explore the sculpture gardens which will lead them to Ann Norton’s studio. They will learn how Ann Norton used plaster to create art. Students will experiment with plaster and how matter changes by creating a plaster cast of a found object in the gardens. (Curriculum will be modified to age appropriate vocabulary, discussions, and experiments)

Benchmarks:

LA. (2 -8).1.6.1 -use new vocabulary that is introduced and taught directly.

Big Idea 8 - Properties of Matter-

A. All objects and substances in the world are made of matter-Matter takes up space and matter has mass.
B. Objects and substances can be classified by their physical and chemical properties.

- SC 1.P.8.1** Sort objects by observable properties, such as size, shape, color, temperature (hot or cold), weight (heavy or light), texture, and whether objects sink or float.
- SC.2.P.8.1** Observe and measure objects in terms of their properties, including size, shape, color, temperature, weight, texture, sinking or floating in water, and attraction and repulsion of magnets.
- SC.2.P.8.2** Identify objects and materials as solid, liquid, or gas.
- SC.2.P.8.3** Recognize that solids have a definite shape and that liquids and gases take the shape of their container.
- SC.3.P.8.3** Compare materials and objects according to properties such as size, shape, color, texture and hardness.
- SC.4.P.8.1** Measure and compare objects and materials based on their physical properties including: mass, shape, volume, color, hardness, texture, odor, taste, attraction to magnets.

Big Idea 9 – Changes in Matter-

A. Matter can undergo a variety of changes
B. Matter can be changed physically and chemically

- SC.2.P.9.1** Investigate that materials can be altered to change some of their properties, but not all materials respond the same way to any one alteration
- SC.4.P.9.1** Identify some familiar changes in materials that result in other materials with different characteristics, such as decaying animal or plant, burning, rusting, and cooking
- VA.A.1. (1) (2)** The student understands and applies media, techniques and processes
- VA.C.1. (1) (2)** The student understands the visual arts in relation to history and culture
- VA.D.1. (1) (2)** The student assesses, evaluates, and responds to the characteristics of works of art
- VA.E.1. (1) (2)** The student makes connections between the visual arts, other disciplines and the real world

Materials:

- Small Paper Plates
- Found Objects (natural and man-made)
- Plaster
- Water
- Measuring cup
- Vaseline
- 6 Medium Sized Bowls and 6 Large Spoons

Prior Knowledge: students can...

- Understand and can give examples of shape, texture, size and weight

Teaching Procedures:

1. Participate in a guided tour of the Ann Norton Sculpture Gardens.
2. Enter into Norton's art studio at the end of the garden tour.
3. Identify various objects and mediums present in the studio.
4. Group and sort the objects according to (size, weight, color, shape, subject, medium...).
5. Learn about the various art processes present in the studio and gardens (with an emphasis on the use of various matters specifically plaster).
6. Coat a paper plate and some found leaves, seeds and objects from the gardens (provided by ANSG staff) with Vaseline.
7. Measure and mix appropriate ratio of powder plaster with water. Notice the plaster heats up and is changing.
8. Pour the plaster into the center of the coated paper plate.
9. Take the coated found objects and place them gently, in an interesting design, onto the plaster.
10. Clean the work area while you are waiting for the plaster to dry for 15-20 minutes.
11. Pull the found objects off of the plaster and you will have an interesting low relief sculpture with impressions from the gardens.
12. See how the plaster changed from a powder to a liquid to a solid.

Indicators of Success:

- Utilize art terms and new vocabulary words
- Demonstrate comprehension of the difference between 2-dimensional and 3-dimensional objects
- Comprehend how matter changes from one form to another
- Learn the additional uses of plaster and how to manipulate plaster

Extensions:

- Research another sculptor that works in plaster compare and contrast their works to Ann Norton's works.
- Discover other uses for plaster.
- Pour plaster into a Vaseline coated plastic bowl. Remove the plaster and use direct carving methods to create a sculpture inspired by Ann Norton's Work.