

Trees of Pittsburgh

by

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Overview

This unit is written for Science classes, grades 1-5. It would also be useful for Language Arts classes doing research about trees. The main goal of the unit would be to meet the Science Standards of the Pittsburgh Public Schools as well as enhance the Foss curriculum. The tree unit would also provide fun and enriching experiences in the Pittsburgh parks. Using the book, The Trees of Pittsburgh, by JoAnn Albert and JoAnn Davis, I would have each age group do several activities pertaining to trees that would fit in well with the Foss Science Module currently being used by their grade level. We would also make several trips to the park to help complete the unit. The first grade completes modules entitled *Balance and Motion* and *New Plants*. Both of these would easily lend themselves to a variety of park activities involving trees. Grade 2 completes modules entitled *Air and Weather*, and *Insects*. Both of these would also fit in well for studying trees in a park environment. Grade 3 studies modules entitled *Measurement*, *Physics of Sound*, and *Earth Materials*. All of these would be natural for park visits with the wide range of sounds, earth materials, and things

to measure found there. We could calculate the heights of trees, and compare the different sizes and discuss sounds one could make using parts of trees. The sound of jumping in leaves is always fun. Grade 4 modules are entitled *Ideas and Inventions*, *Magnetism and Electricity*, and *Water*. Since grade 4 would be into inventions, it would be their job to research the various trees and tree products. Water would also fit in well as far as what it would have to do with trees in the park environment. The students could even collect a variety of objects to test to see if they are magnetic or conduct electricity. The grade 5 modules are *Variables*, *Lever and Pulleys*, and *Mixtures and Solutions*. The fifth grade may be able to use some feature of their park experiences to design an original experiment which would fit in with the Variables module, or maybe they could design a simple machine that would utilize the Levers and Pulley unit, but I think that they would probably enjoy just sitting in the park composing tree inspired poetry or prose.

Rationale

I chose to present a unit on trees for several reasons. Joyce Kilmer's poem about trees was one of the first my mother ever read to me. The beauty, usefulness and variety of trees have always impressed me. Finally, trees are something that all five of the grade levels that I teach can relate to. All Pittsburgh Public School students are required to complete standards based portfolios which include a personal narrative, a response to literature, a report of information, a compare and contrast piece, a research report, a persuasive essay, and a piece of poetry or prose of the student's choice. The older students also have a speaking, viewing, listening requirement. Studying trees could certainly meet any or all of these requirements. Pittsburgh Public School students are also required to read twenty-five books by at least four different authors and in at least four different genres. I have books about trees for all age levels, so my students could read them as one of their choices of non-fiction genre. The tree unit will also enable the students to meet the Communications and Science Standards as mandated by the Pittsburgh Public Schools. These will be listed in the appendix.

Objectives

I plan to meet the following objectives.

1. The student will be able to do independent research using the library and the computer. I will insist on at least three sources for any written or oral report. They will choose a tree or tree product to research.
2. The student will write a descriptive paragraph or poem pertaining to trees.
3. The student will be able to compare and contrast trees and their parts.

4. The student will write a persuasive paragraph about saving the trees.
5. The student will identify the effects of seasonal changes on trees.
6. The student will identify and define the parts of a tree.
7. The student will measure parts of trees
8. The student will estimate the age of a tree.

Strategies

Frick Park has seasonal theme visits three times of the year. The first one is scheduled for the fall, just as the leaves are beginning to change. I will begin the unit as soon as I have the first visit scheduled. We always begin every unit by listing what we already know. Then we make a list of what we want to find out. All of the children have seen trees. They all know about the changing color of the leaves. We can see several trees just by looking out the classroom window, so I'm sure that we will be able to generate quite a long list. I will give my own little history, about all the fruit trees in my backyard and how I climbed them and picked the fruit to eat. I'm sure all of them will have some story to add to the discussion. I have several age appropriate books that we can read together. These go into the history, importance, uses and types of trees. They also describe the parts of a tree. I also have posters that illustrate the parts of the tree and list tree trivia which the children enjoy discussing. I will complete any of the details that the books have missed about the history or physiology of trees. I will have the students work in groups according to the Foss model of principal investigator, recorder, timekeeper, and materials manager. They are used to doing this, and it works well. During each visit to the park, there are activities that are provided by the park staff. In addition I would have each group also complete activities that pertained to their particular grade.

During the first visit to the park, the first graders will collect and sort seeds that are plentiful in the fall. They could spin, roll and balance the seeds since that is what we will be working on at that time. Grade 2 will be working on seasons and weather then, so they could collect the leaves that indicate the season is changing. Back in class they could sort them and make leaf rubbings. Grade 3 will be into measurement so we could choose a leaf or twig to use as a unit of measurement. We will measure a variety of park items and compare them to the actual metric measurements. It will be easy to carry the measuring tapes to the park. Grade 4 actually works on leaf venation patterns at this time, so they can also collect leaves to study and sort back in class. I always have them make leaf mobiles using twigs which they can also collect at the park. Grade 5 can make observations of the trees, and collect a variety of barks or leaves to see which kind would float the longest or hold the most pennies while they are floating. This goes with one of the Foss experiments.

Our second trip to the park will take place in the winter when most trees are bare. This time I will have all groups bring a plastic bag to collect twigs and other items that would pertain to their classroom activities. Grade one could collect twigs to try to balance things on. Grade 2 could bring back their twig and make a picture with it. This would also be a good time to compare deciduous and evergreen trees. Grade 3 could do a variety of measurements such as weighing the twig, and measuring the length and circumference. We would also compare the temperatures of the two different seasons. Grade 4 could use their twigs to make a slingshot or invent some other type of toy. At this time grade 5 will be onto simple machines so they could use their twig as a lever to lift some other article they found in the park.

By the time we visit for the third time, it will be spring. Grade one will be into planting so they can compare the parts of the tree to parts of other plants that they observed. We could try to bring back a cutting to plant. Second grade will be studying insects, so they can bring their little bug boxes and collect some. They can also observe insect homes in the trees. Grade 3 can make a list of sounds and compare them to the quieter sounds of the winter. They can also collect rocks, which we will be studying by this time. Grade 4 should be studying water by now, so they can look for signs of water in the park. It will also be close to Earth Day by this time, so I will have them think of ways they can protect the trees. I will have the fifth grade bring a paper and pencil to the park so they can either draw trees or write poetry or a personal narrative about their observations. I will also add some age appropriate writing or other activities back in the classroom as a follow-up to the park visits. These will be described in the activities section of the unit.

Arbor Day, the annual observance dedicated to the planting and conservation of trees, takes place on April 22, so I will try to have the spring trip around that time. Julius Sterling Morton, a Nebraska newspaper editor, conceived Arbor Day in the 1870s. He believed that planting trees would help beautify the state, provide shade, and prevent soil erosion. The first Arbor Day was held on April 10, 1872 in Nebraska. It is now observed nationally and in many countries throughout the world on Morton's birthday which is April 22.

Narrative

Trees are
the largest of all plants and
are the oldest known living things on
earth. Some live for hundreds, even thousands
of years! Trees provide shade and offer beautiful
areas for recreation. They are homes to countless creatures in
the Animal Kingdom. Each spring, tree buds and flowers herald
the coming of warm weather. In fall, their leaves can be a kaleidoscope
of crayon colors. Some trees bear fruit and nuts and offer food for
people and other animals. Thousands of different products come
from trees, too. Spices, lumber, paper, plastics, chocolate, medicines
fuel, and rubber are just a few. And how could we have treehouses
without trees? On a global scale, trees hold down topsoil, help prevent
flooding, and influence our climate. Tree leaves absorb carbon dioxide
from the air and release oxygen to make our air more breathable.
There are about 20,000 different kinds of trees on the earth.
I will only be able to discuss some of them in this unit.
We must protect the trees that are here, and plant
new trees for future generations to enjoy.
Hopefully my students will learn
to work together
to keep a
healthy
balance
of the
earth's
resources as
they learn to treasure trees

Forests cover almost a third of the world's total land area.

Trees first fascinated me when I was five years old. My family had been living in a duplex on a street that had no trees to speak of. My mother told me we were moving to a house on a street named Shady Avenue. She said that it was named that because of the number of shade trees on the street. I don't know if she was right about the name, but she was certainly correct about all of the trees. The whole block was lined with trees on both sides. We had two right in front of the house, and what's even better than that, we had four in the backyard! I learned at that early age, that not only could trees be differentiated by their leaves, they could be identified by their bark. The two trees in the front of the house, were a

maple and an oak. As a kindergartner, I was learning about shapes and colors. It became very easy for me to tell the difference between the shapes and venation patterns of the two trees. As the leaves began to change color in the fall I noticed that the maple leaves became red while the oak leaves became bright orange. It wasn't until I actually began teaching science myself that I learned those leaves changed color because of the chemicals that were already in them. Another thing that amazed me as a five-year old was the different type of seeds that the trees produced. Maples had those cute little twirly things that were fun to chase in the wind while the oak had acorns. It was not unusual to see the many neighborhood squirrels collecting those acorns.

Some scientists estimate that more than 19 acres of tropical rain forest in Central and South America are being destroyed every minute. That means an area over twice the size of the Hawaiian Islands is disappearing each year.

The trees in the backyard were all fruit trees. We had an apple, cherry, peach, and pear. These were low enough to climb. I learned many lessons from these trees also. I learned which branches were thick enough to hang from and which weren't. You don't have to fall too many times to figure that out. In those days, I had permanently skinned knees so I could observe the different bark patterns on my own legs. I also discovered that some bark was very easy to peel and some couldn't be peeled at all. The best thing about the backyard trees was the fruit that they produced. The peaches were incredibly delicious! I hope that the trips to Frick Park will create the same natural interest in trees for my students.

In the 1300s, France's forests were so reduced and wood so scarce that wooden coffins were often rented and re-used.

A tree is a woody plant with a distinct main stem called a trunk. At maturity, trees are usually the tallest of plants. Their height and single main stem differentiate them from shrubs, which are shorter and have many stems. Trees are perennials, (plants that live for at least three years.) Some species of trees only grow to 13 feet in height, but the tallest species may reach heights of more than 367 feet. That is taller than the Statue of Liberty. The General Sherman Tree, a giant sequoia in California's Sequoia National Park, has a height of 275 feet and a diameter of 37 feet. However, the largest trees are not necessarily the oldest. The bristlecone pine that only grows to a height of thirty feet has a specimen that has been dated at least 4600 years old. Trees grow throughout the world, from the extreme cold regions near the Arctic and the Antarctic to the hot tropical regions around the equator. They grow in both good and poor soil, in deserts and swamps, along shores, and at mountain elevations of several thousand feet. Every child in my room knows that some trees lose their leaves in the fall, and that

evergreens or Christmas trees as they like to call them, don't. I will remind them that trees that lose their leaves are deciduous, and the evergreens are coniferous.

A well-positioned shade tree can keep a house 20% cooler in summer.

As I mentioned before, trees have many uses. Perhaps the most important ecological function of trees is protecting the land against erosion. The trunks and branches of trees provide protection from the wind, and tree roots help solidify soil in times of heavy rain. In addition, trees and forests store water reserves that act as buffers for the ecosystem during periods of drought. Trees and forests also provide habitat, protection, and food for many plant and animal species. In addition, they play an important role in global climate and atmosphere regulation—the leaves of trees absorb carbon dioxide in the air and produce oxygen that is necessary for life.

The slippery elm was “responsible” for the spitball--a tricky pitch thrown by baseball pitchers in the days of Babe Ruth. Pitchers would chew slippery elm seeds, then rub the liquid onto the baseball. The resulting pitch was very hard to hit.

Trees have many economic uses also. Lumber from trees is the most widely used material in the building of homes and other structures. Many trees yield edible fruits and nuts such as oranges, grapefruits, apples, avocados, pecans, hickory nuts, almonds, and those delicious peaches that I remember. Trees and their fruits are also the source of many commercial waxes and oils, including olive oil and coconut oil. Tree trunks are tapped for sap, which is used in making such products as maple syrup, rubber, and turpentine. The barks of certain trees are sources of cork and spices. Many trees yield important medicines, such as quinine. The bark of the yew tree is the source of the drug taxol, which in 1992 was approved for treating ovarian cancer. Chemical materials produced by trees are used in tanning leather and in the manufacture of inks, medicines, dyes, and wood alcohol. In addition, trees are used in landscaping homes, parks, and highways. In regions with extreme climates, they serve as windbreaks or as shade against the sun.

Every year in the United States, each person uses enough tree products to make up a tree about 1999 feet tall and 16 inches wide.

The major parts of a tree are its roots, trunk, leaves, flowers, and seeds. These components play vital roles in a tree's growth, development and reproduction. Trees are held in place by anchoring organs called roots. In addition to anchoring the tree, roots also absorb water and minerals through tiny structures called root hairs. From the roots the water and mineral nutrients are carried upward through

the wood cells to the leaves. Although the internal structure of most kinds of roots is similar, there are often external differences. Pines for example have a strongly developed taproot, or main root, in addition to branching side roots. In maples, on the other hand, there is little or no central taproot, and the other roots are produced in great numbers near the surface of the soil. As a matter of fact most tree roots don't go that deep into the ground. Rather they spread out closer to the surface of the soil. In many cases they are even visible. Roots are constantly growing.

A large leafy tree may take up as much as a ton of water from the soil every day.

The trunk of the tree is covered by a protective outer covering called bark. It protects the tree from attacks by animals and fungi, from drying out, and even from forest fires. Because bark varies so widely in color, texture, and thickness, its characteristics provide one of the most important means of identifying species of trees. Most of the total thickness of bark consists of outer bark, which is made up of dead cells. Outer bark may be very thick, or quite thin. The bark of a birch tree may be only $\frac{1}{4}$ inch thick, while the bark of a giant sequoia can be as much as 2 feet thick. Openings in the outer bark allow the movement of carbon dioxide and oxygen to and from the inner tissues.

Each year, almost 100 billion cubic feet of wood are harvested from the world's forests.

Just like skin, bark has an inner layer. It is called phloem and is made of living cells. These cells act together to transport food in the form of sugars, which are made in the tree's leaves, through the trunk and stems to other parts of the tree. Phloem cells have thin walls, and their living contents are so interconnected that the sugar solutions can pass easily and rapidly from one end of the plant to the other. As old layers of outer bark are sloughed off, new ones are constantly being added from the inside, where new phloem is always being created.

Enough firewood is used each year in the United States to build a 100-foot tall wall of wood that could stretch from New York City to San Francisco.

Most of a tree trunk is occupied by the wood, or xylem layer, which consists almost entirely of dead cells. The living xylem cells, however, act as the tree's plumbing system by transporting water and dissolved food through the trunk and stems. A layer of cells called the cambium separates the living xylem cells from the phloem. As the tree grows and develops, the cambium forms new phloem and xylem cells. The layers of xylem cells form rings; these rings can be counted to determine the age of the tree. I have several examples of sections of tree trunk that the children can count. They love to do this.

The baobab tree of Africa has an incredibly thick trunk. This trunk, up to 90 feet in circumference, can store up to 25,000 gallons of water.

The principal function of the leaves is the manufacture of sugars by the process of photosynthesis. In this process, sugars are formed when carbon dioxide and water are combined in the presence of light and chlorophyll. Oxygen is produced as a byproduct. Some of the newly formed sugar is used by the leaf cells for energy, but most is carried to other parts of the tree to provide energy for growth and development in those areas.

The leaves are also the chief organs involved in the loss of water from the plant, called transpiration. Many of the tree's tissues cannot function without a constant supply of water, and water is necessary to prevent overheating or wilting of the leaves. Transpiration is responsible for the movement of water from the roots of the tree up to the top. As water is lost through the leaves, water that enters the roots is pulled upward through the xylem tissue to replace the lost moisture, ensuring a constant circulation of water through the tissues of the tree.

The ginkgo tree is a "living fossil." Unlike most other kinds of trees living today, the ginkgo was around during the days of the dinosaurs.

Leaves come in many different shapes, sizes and textures. The leaves of a deciduous tree are either simple or compound. A simple leaf is just one leaf attached to a stem. Compound leaves are a collection of leaflets attached to one stalk. The leaves have three main venation patterns; palmate, pinnate, and parallel. I always have children collect leaves in the early fall when they are still green and not dried out. Then it is easy to feel if the leaf is smooth, rough, or fuzzy. Fuzziness always intrigues the younger children. If you feel around the edge of the leaf, you can also detect differences in the outlines of the leaves. Some are perfectly smooth, while some seem to have little teeth. Leaves of coniferous trees are usually needlelike in appearance.

An acre of trees can remove about 13 tons of dust and gases every year from the surrounding environment.

In climates where the temperature drops and there is no longer as much sunlight, the leaves lose their chlorophyll and revert to their natural color. The leaves fall off, and the tree goes to sleep for the winter. Coniferous trees also lose their leaves, but not all at the same time. In the autumn, when the trees are losing their leaves, many seeds are also falling to the ground.

By-products of trees may one day take over the job now performed by oil, gas, and coal.

All trees produce seeds that are distributed in various ways. Some are inside the fruit of the tree such as cherries and may be carried by animals. Some are encased in hard shells such as acorns that simply fall off and may be carried by animals as well. Some are enclosed in winged containers and simply flutter away in the wind. Finally, some are carried by water. Coniferous trees also have seeds, but they grow inside cones. The cones come in a variety of shapes and sizes according to the species of evergreen that they are from.

Albizzia trees of Malaysia are among the fastest growing trees in the world. Some can grow as much as 30 feet in one year. That's almost an inch a day!

Many trees produce flowers. They range in size from small and inconspicuous, to large and colorful such as magnolias. Birds, insects, bats or even the wind may transfer the pollen from the flowers. Each flower has its own particular scent and color which helps to add to the wonder and beauty of nature.

Nearly half of the world's population depends on wood as its major source of fuel for heating and cooking. In fact, almost 2/3 of all the wood cut in the world is used for fuel.

Activities

I have divided the activities by season and then grade. I have tried to provide pre, during and post activities for each age group for each season.

Fall Activities

Grade 1

Before our first trip to the park, I will read one or two of the tree books from my personal collection that is suitable for first graders. I think that Now I Know Trees by Sharon Gordon, and Look at a Tree by Eileen Curran would be good choices.

For their park activity, I will have the students collect leaves and seeds. When we take them back to class they will sort them according to size and shape. Since we will be in the middle of *Balance and Motion* at this time, I will have them see if any of the seeds roll. We will then match the seed to the leaf of the tree it came from. I have a nature finder called Trees from Huber Science that will assist with

this. It identifies trees by their bark, leaf and seed. There is also an interactive game at www.Fossweb.com that will help them do this. I will let them choose one leaf that I will encase in contact paper for them and let them wear it as a necklace.

Grade 2

At the time of first trip to the park, grade 2 will already have discussed fall weather and the possible changes that might have occurred to the trees as a part of the *Air and Weather* module. I would have them focus on those changes. I would read Look What I Did with a Leaf! by Morteza Sohl and A Tree is Growing by Arthur Dorros. I will have the second graders collect leaves in as many fall colors as they can find. When we get back to class, they will use their leaves to make rubbings with the fall color crayons. We can also use the leaves to make animals and other shapes as suggested in the Leaf book. The book is quite detailed about what shapes and sizes of leaves to use to construct various animals. You paste the leaves to oak tag or shirt cardboard with rubber cement. Then you cover the whole creation with clear contact. It looks quite impressive when complete. We also make models of the fall trees with construction paper. Each student draws the tree trunk on a piece of drawing paper. Branches are a series of backward Ys. He/she then cuts leaves out of red, orange, or yellow construction paper and glues them to the paper with school glue.

Grade 3

Grade 3 will be working on the *Measurement* Unit in the fall. Each year we choose something other than a standard unit to use as a unit of measurement. I usually have them use paper clips or their hands. This year I will have them use leaves also. The students will work in groups, and each member of the group will choose a different kind of leaf. Since the class will be learning about measurement then, I will suggest that they choose several sizes of the same variety. We will use The Trees of Pittsburgh from the Western Pennsylvania Conservancy as a guide. The children will be able to identify their own leaf with the book. The book also gives the range of dimensions for each leaf so each student will be able to see where his or her leaf fits within that range. Each group will also carry a measuring tape to the park and each member of the group will choose a tree to find the circumference of. When we bring the leaves back to the room, we will actually be able to weigh them. Then we will find a variety of objects to measure with the leaves. Finally they can line their leaves up in order of size and trace around them thus making a permanent record. It looks pretty when the outlines are colored in. Each student will write a short paragraph about his or her day in the park. Here is a sample paragraph:

My Day at the Park

Yesterday I took a trip to the park with my class. I saw many squirrels climbing the trees there. Some were even holding acorns. I collected some acorns that were different sizes. I think that I will plant an acorn in my backyard to see if it grows. There were also many rocks. Sometimes when I picked up a rock, there were bugs underneath.

The leaves are already changing color, so I saw many shades of red, orange, yellow, and brown. Some trees still had green leaves, and some had needles. Leaves come in many sizes and shapes. I brought some back to class to make designs with. My group and I were able to identify our leaves with our little leaf book. It was fun to go to the park.

Grade 4

In the fall, the fourth grade works on *Ideas and Inventions*. As a part of the unit the students study the venation pattern of leaves. Before we visit the park we will observe simple and compound leaves and their venation patterns. The Eyewitness Books Trees by Allen Coombes is a good resource for this. During their visit to the park I will challenge the students to collect as many leaves as they can with different venation patterns. (Please see the sheet with venation patterns in the appendix.) We also do leaf rubbings in the fourth grade. I always have the students arrange their leaves in some meaningful way and hang them from a twig to make a mobile. This class will also be able to use The Trees of Pittsburgh from the Western Pennsylvania Conservancy to identify their leaves. The park would certainly be a good place to collect the twigs to use for the mobiles. I will also bring some thin paper so they can do some bark rubbings as well.

Grade 5

In the fall, the fifth grade works on a module entitled *Variables*. The goal of the unit is to teach students the Scientific Method to set up an experiment. Ideally, by the end of the unit everyone should be able to set up his/her own experiment. One of the experiments in our unit involves testing things that sink or float, so for their park activity each cooperative group will collect eight or ten objects to test. I would also suggest that each group brainstorm and come up with an idea for a new experiment to create with things that they have found in the park. The book Eyewitness Explorers Trees by Linda Gamlin gives some good suggestions for experiments using trees in case the students can't think of any of their own. Here is a sample experiment.

Watching Leaves Breathe

Leaves are breathing all the time. They take some gases in and give others out. As this happens, they automatically lose water vapor. You can not see water vapor because it is a gas. If you put a plastic bag over a leaf, you can turn water vapor back to liquid water. Put the leaf in a plastic bag and secure it so that it is airtight. Check it about an hour later, and you will see water droplets in the bag.

Winter Activities

Grade 1

Because of what we read in previous lessons, and just from the trees located around the school, the children will already know that the only trees that they see with leaves will be evergreens. I will suggest that they find as many different types of evergreens that they can. Since we will still be working on the *Balance and Motion* unit, I will have them try to find things that may roll down our ramps. Since most of the trees will be bare, it might be a good time to discuss how they are sleeping and getting ready for a new year. I will explain how trees add a ring for each year of growth. I do have cross sections of tree trunks in my classroom that we can observe and count the rings when we return from the park. In a subsequent lesson the class can make evergreen trees and balance the decorations on them.

Grade 2

As the winter begins, the second grade will be wrapping up the *Air and Weather* module, and beginning *Insects*. Using one of my reference books such as Discovering Trees by Keith Brandt, we will discuss the differences between the fall and winter trees. The most obvious difference of course is that most winter trees have no leaves. This would also be a good time for a lesson on the difference between deciduous and coniferous trees. On our winter trip to the park I will have students observe the changes that winter brought to the park and look for signs of insects or insect homes. In addition to the fact that the branches are bare, the students should notice that there are very few insects or other animals. They may notice some signs of vacant insect homes or birds' nests because they are easier to see when there are no leaves to hide them. The students should also notice that the bark and branches of trees are drier in the winter.

Grade 3

By the winter, grade 3 will be completing *Measurement* and beginning *Physics of Sound*. I think that for our park activity most third graders will be ready to do a more complicated measurement such as estimating the age of a tree. They will work in pairs. Here are the steps to follow:

1. Choose a tree and measure the circumference of it approximately 4 feet off the ground.
2. Divide this number by pi (3.14).
3. This will give you the diameter of the tree.
4. Take the diameter measurement and multiply it by the tree species factor found below:

Diameter x tree species factor = age of tree

Tree Species Factors

Norway Maple	4
Red Maple	4
Silver Maple	3
Sugar Maple	5
Hickory	7
American Beech	6
White ash	5
Tuliptree	3
American Sycamore	4
Black Cherry	5
White Oak	5
Red Oak	4

I will also ask the third graders to pay attention to the sounds that they heard on this trip. When we get back to class we will compare the ages of various trees, and either write or draw about a sound that was heard. Here is a sample paragraph:

Cracking Twigs

When I was walking through the park today one of the sounds that I heard most often, was the sound of twigs cracking as my friends walked over them. The thicker shorter twigs made a lower pitched sound than the longer thinner twigs. You could also make different noises with the twigs by rubbing them together or by striking them on each other or a rock. If you took a thick rubber band and put it around a small branch, you could pluck it, and make an entirely different sound. Playing with and listening to twigs can be fun.

Grade 4

As winter begins, grade 4 will be completing *Ideas and Inventions*, and beginning *Magnetism and Electricity*. I will have them bring plastic bags to collect materials that they could make something out of. They could also use the same set of items to test if they are magnetic or conductors or insulator. This would go right along with the Foss experiments. At this time I would have each fourth grader choose a tree product to research independently. This would be used as one of the requirements for their portfolio. Here is a sample report:

Chocolate

Chocolate is the Western world's most popular flavor for candy, bakery products, ice cream, and beverages. It has nutritional value because it contains fat, carbohydrate, and protein. It also gives quick energy. For this reason, explorers, astronauts, athletes, and soldiers often carry it with them. I carry it because it tastes good.

The Aztec and Mayan Indians of Mexico were eating chocolate in the early 1500s. Chocolate comes from oval shaped cacao beans. These beans are found in pods that grow on cacao trees. After the beans are removed from the pods, they are allowed to ferment and dry. The cacao beans are roasted, then shelled, and ground into small pieces. The grinding releases cocoa butter, an oily substance, from the seeds. Cocoa butter is combined with pieces of the beans to make chocolate liquor. Chocolate liquor is the base of all chocolate products. It is cooled and hardened into blocks to make baker's or unsweetened chocolate. Sugar is added to it to make sweet and semi-sweet chocolate. When sugar and milk are added, milk chocolate results. Cocoa powder, made from the liquor is used to make hot chocolate, one of my favorite winter treats. About 1.5 million tons of ground cacao beans, from the tropical cacao tree, are used each year to make chocolate and cocoa products. That's greater than the weight of more than 300,000 elephants.

Grade 5

In the winter, grade 5 will be studying *Levers and Pulleys*. I will have them collect materials from the park that they would be able to create a simple machine from. Prizes could be awarded for the most original machine. I would also have them choose a tree to write a research report about. This would be a part of their portfolio requirements. Here is a sample report:

Sugar Maple

The sugar maple is one of the most valuable maple trees. Its light reddish-brown lumber is sturdy and strong. It is used to make furniture, cabinets, floors, boxes, musical instrument parts and many other things. It also burns slowly and is an efficient fuel. When I was younger, I had a sugar maple right in front of my house, and I shared a maple bedroom set with my sister. That is why I chose to report about sugar maples.

Sugar maples grow from Georgia north to Newfoundland and from the east west to Texas and Manitoba. They reach heights of 75 to 100 feet and make excellent shade trees. The one in front of our house was really big, and it did keep the house cool. They have smooth gray bark and broad dark green leaves with five lobes. (Some other maples only have three lobes.) In autumn, the leaves change to brilliant orange, yellow, and red. The maple leaf is featured on the Canadian flag and is the official emblem of Canada. The sugar maple is the state tree of New York, Vermont, West Virginia, and Wisconsin.

Maple seeds grow together in pairs with wing-like formations on each side. When the winged seeds twirl and fall to the ground, they look like propellers on a helicopter.

In early spring, sugar maple trees are tapped so that the colorless, sugary sap can flow through holes in the trunks. The sap is collected and boiled to make maple syrup and maple sugar. Approximately 35 gallons of sap are needed to make one gallon of sweet, thick maple syrup. If the sap is allowed to boil beyond the syrup stage, it becomes maple sugar. Native Americans first showed English and French settlers how to do this. Today the production of maple syrup and sugar is a big business in Vermont, New York, Ontario, and especially Quebec. You can also purchase homemade maple syrup right near Pittsburgh. My family used to take trips to Ligonier in the early spring to do exactly this, and it was delicious.

Spring Activities

Grade 1

By this time, the first grade will be studying the *New Plants* module. Within this module we learn about the parts of a plant, and how plants grow. In the classroom, we grow plants from seeds, bulbs, and cuttings. In the park, I will have the students observe how a tree is really a big plant, and they can compare the main tree parts to other plants that they have learned about. When we come back to class, I will provide worksheets that identify the tree parts, and pictures of trees to color. There is also a fun game that the children like that I use when identifying the parts of the tree. If you say “trunk”, they stand perfectly still with their arms at their sides. If you say “roots,” they bend down and touch their toes. If you say “branches,” they hold out their arms, and if you say “leaves,” they wave their hands.

Grade 2

Grade 2 will be studying the *Insect* module in the spring so I will have them bring the magnifying bug boxes, and divide the children into groups. Each member of the group will see if they can find a different kind of bug. I would expect them to find a variety of beetles or ants. A few may be quick enough to catch a grasshopper. The children should already know that the bugs have three main body parts, head, thorax and abdomen and six legs. There is a site on www.fossweb.com, which will help them to identify their individual insects when we get back to class. I will also have them do a short report on an insect. This will meet a portfolio requirement. We make insects using egg cartons. This will be a recycling project for earth day. Finally we will compare what the trees were like in the spring to the fall and winter seasons. Then they can construct their spring trees using tissue paper. Here is the sample bug report.

Firefly

A firefly is also known as a lightening bug. It is very common in North America. It is partly nocturnal. It is a luminescent beetle, which means that it glows. At night, the very end of the firefly glows a bright yellow-green color. The firefly can control this glowing effect. The brightness of a single firefly is 1/40 of a candle. Fireflies use their glow to attract other fireflies. Males flash about every five seconds; females flash about every two seconds. It is about .75 inches long. It is mostly black, with two red spots on the head. The wing and head are lined in yellow. Like all insects, the firefly has a hard exoskeleton, six jointed legs, two antennae, compound eyes, and a body divided into three parts. Fireflies eat other insects, insect larvae, and snails. They will eat other fireflies.

Grade3

By the spring visit, the third graders should be completing *Physics of Sound* and beginning *Earth Materials*. On their visit to the park, I will ask them to make a list of sounds and what is making the sound. I will also have them collect a variety of rocks. We will keep the rocks in egg cartons, another good reuse of egg cartons. When we get back to class we will compare the sounds heard in the spring to those heard in the winter. Undoubtedly they will have heard more birds and bugs than in the winter. I will ask them to do a brief report on one of their rocks, once again meeting a portfolio requirement. Here is the model:

Granite

Granite is an igneous rock that forms when magma cools deep in the earth's crust. It makes up about 22% of the earth's crust. Its main ingredients are feldspar (about 60%), quartz (about 30%), black mica and hornblende. Usually light in color, granite often has a salt-and-pepper appearance because of the dark minerals sprinkled throughout the lighter-colored minerals. In some areas granites have a decidedly pink cast because of the color of the feldspar. The size of the crystals in a particular mass of granite depends on the rate at which the magma cooled. The slower the cooling, the bigger the crystals. Because of its hardness, it polishes well and is popular for buildings and monuments.

Grade 4

By spring the fourth grade will be studying the *Water* module. Obviously trees need water. In fact they need vast amounts of moisture to survive. Since trees, unlike animals, can't roam to find their water, they send their roots on a quest for it. As their root tips dig deeper into the ground, millions of microscopic hairs wrap around each tiny grain of soil to absorb its moisture. A full-grown tree can command hundreds of miles of roots, all probing the soil in the search to quench its insatiable thirst. The water is distributed inside the trunk as if it were a small plumbing system. Other than having them look for signs of water in the park, I will have the fourth graders pick up litter as part of their earth day activities. Back in the classroom we will discuss what else that they as children can do help save the earth and protect the environment. We will discuss keeping the air, water, and soil free of pollution. We will also make posters using the Earth Day motto of Recycle, Reuse, and Reduce. Here is a sample Earth Day report:

Earth Day

In 1963, Senator Gaylord Nelson began to worry about our planet. He knew that the world was getting dirty and that many of our plants and animals were dying. He wondered why more people weren't trying to solve these problems. He talked to other lawmakers and the President.

In 1969, Senator Nelson decided to have a special day to teach everyone about the things that needed to be changed in our environment. He wrote letters to all the colleges and put a special article in Scholastic Magazine to tell them about the special day. He knew that he could count on students to help.

On April 22, 1970, the first Earth Day was held. People all over the country made promises to help the environment. Everyone got involved and since then, Earth Day has spread all over the planet. April 22 is our special day to look at the planet and see what needs to be changed.

Grade 5

In the spring, grade 5 will be working on *Mixtures and Solutions*, which would be hard to connect to trees so prior to the final park visit I will discuss with them what exactly makes a tree useful and beautiful. They will carry paper and maybe even a sketchpad to the park and focus on the beauty of trees. Using Joyce Kilmer's poem as an example, I will have them write either a poem or essay about the beauty and worth of trees. Of course, this can be added to their portfolios.

Trees

by Joyce Kilmer

I think that I shall never see
A poem as lovely as a tree.
A tree whose hungry mouth is prest
Against the earth's sweet flowing breast;
A tree that looks to God all day,
And lifts her leafy arms to pray;
A tree that may in summer wear
A nest of robins in her hair;
Upon whose bosom snow has lain;
Who intimately lives with rain.
Poems are made by fools like me,
But only God can make a tree.

Culminating Activity

This year they have been adding an addition to Mifflin School. To do this, they had to cut down several trees that have been there for a long time. Therefore, as a culminating activity, and to coincide with Arbor Day, I will have each group plant a tree. We will have a little ceremony. Some of the students will read their poetry and other writings.

“When we plant a tree we are doing what we can to make our planet a more wholesome and happier dwelling place for those who come after us, if not for ourselves.”

Oliver Wendell Holmes

Bibliography

Books

Albert, Jo Ann, and Davis, Jo Ann, The Trees of Pittsburgh, Environmental Concepts, Pittsburgh, 2003. *This book is perfect for this unit because it has activities pertaining specifically to the trees of the Pittsburgh parks. It also has excellent pictures to help with tree identification.*

Benvie, Sam, The Encyclopedia of North American Trees. Firefly Books, New York, 2000. *This is a reference to help identify trees.*

Bernath, Stefan, Trees of the Northeast, Dover Publications Inc., New York, 1979. *This is a coloring book with pages that may be copied for the children to color.*

Brandt, Keith, Discovering Trees, Troll Associates, New Jersey, 1982. *This text offers simple explanations about the parts and life cycles of trees. It is good for first and second graders.*

Burnie, David, Tree, Alfred A. Knopf, New York, 1988. *This book goes into more detail about the physiology of a tree. It would be good for the fourth and fifth graders.*

Coombes, Allen J., Eyewitness Books Trees, DK Publishing Inc., New York, 1992. *This book has wonderful pictures and thorough details about everything that has to do with a tree. It is a good reference for the teacher.*

Curran, Eileen, Look at a Tree, Troll Associates, New Jersey, 1985. *This book has very basic information about trees and would be easy for a young child to read himself/herself.*

Dorros, Arthur, A Tree is Growing, Scholastic inc., New York, 1997. *This is an introduction to trees that would be good for second or third graders.*

Fergus, Charles, Trees of Pennsylvania, Stackpole Books, Pennsylvania, 2002. *This is a good reference book for help in identifying specific Pennsylvania trees.*

Gamlin, Linda, Eyewitness Explorer Trees, DK Publishing Inc., New York, 1997. *This book has good experiments and activities that would be useful for fourth and fifth grade.*

Gordon, Sharon, Now I Know Trees, Troll Associates, New Jersey, 1983. *This is a simple picture book suitable for first grade.*

Little, Elbert, National Audubon Society Field Guide to North American Trees, Albert A Knopf, New York, 1997. *This is exactly what it says it is, a guide to identifying North American Trees.*

Markle, Sandra, Outside and Inside Trees, Scholastic, Inc., New York, 1993. *This book has really good pictures of bark and leaves. It also has good pictures of cross-sections of bark and leaves.*

Petrides, George, Eastern Trees, Houghton Mifflin Co., Massachusetts, 1988.

Smith, Kathy, Trees It's Our Planet, V. Nichols, 1992. *This book focuses on the environmental effects and uses of trees.*

Sohi, Morton, Look What I did With a Leaf, Walker and Co., New York, 1993. *This book demonstrates different animal designs that students could make with leaves.*

Zim, Herbert, Trees, St. Martin's Press, New York, 2001. *This is a full-color, easy-to-use guide to identify trees.*

Microsoft Encarta Sites

“Arbor Day,” ®Encarta®, 1993-2001, Microsoft Corp. *This site gave a brief history of Arbor Day.*

“Earth Day,” ®Encarta®, 1993-2001, Microsoft Corp. *This site gave a brief history of Earth Day.*

“Trees,” ®Encarta®, 1993-2001, Microsoft Corp. *This site gives a good basic background of the history and physiology of trees.*

Web Sites

<http://www.enchantedlearning.com> *I found this site on Google. It has good activities for elementary students.*

<http://www.fossweb.com> *This site accompanies the FOSS science modules. There are activities and additional information about each module topic.*

<http://www.google.com> *This is a good search engine for anything you need.*

<http://www.kidsdomain.com> *This site has good activities for very young students.*

<http://www.massmaple.org/tree> *This site was an excellent source of information about all types of maple trees.*

Poster

Kerlin, Kimberly, Tree Trivia, Project Learning Tree *This poster listed the facts that I have italicized throughout the unit.*

Student Reading List

Albert, Jo Ann, and Davis, Jo Ann, The Trees of Pittsburgh, Environmental Concepts, Pittsburgh, 2003.

Bernath, Stefan, Trees of the Northeast, Dover Publications Inc., New York, 1979.

Brandt, Keith, Discovering Trees, Troll Associates, New Jersey, 1982.

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Gordon, Sharon, Now I Know Trees, Troll Associates, New Jersey, 1983

Gamlin, Linda, Trees, DK Publishing Inc., New York. 1997.

Markle, Sandra, Outside and Inside Trees, Scholastic, New York, 1993.

Podendorf, Ella, Insects, Childrens Press, Chicago, 1981

Smith, Kathy, Trees It's Our Planet, V. Nichols, 1992

Sohi, Morton, Look What I did With a Leaf. Walker and Co., New York, 1993

Materials for Classroom Use

Bug boxes
Clear Contact
Computers
Construction paper
Crayons
Egg cartons
Glitter
Glue sticks
Magnifying glasses
Measuring tape
Protractor
Rubber cement
School glue
Scissors
Text books
Tree books

Communication Standards

1. All students use effective research and information management skills, including locating primary and secondary sources of information with traditional and emerging library technologies.
2. All students read and use a variety of methods to make sense of various kinds of complex texts.
3. All students respond orally and in writing to information and ideas gained by reading narrative and informational texts and use the information and ideas to make decisions and solve problems.
4. All students write for a variety of purposes, including to narrate, inform, and persuade, in all subject areas.
5. All students analyze and make critical judgments about all forms of communication, separating fact from opinion, recognizing propaganda, stereotypes and statements of bias, recognizing inconsistencies and judging the validity of evidence.
6. All students exchange information orally, including understanding and giving spoken instructions, asking and answering questions appropriately, and promoting effective group communications.
7. All students listen to and understand complex oral messages and identify the purpose structure, and use.
8. All students compose and make oral presentations for each academic area of study that are designed to persuade, inform, or describe.
9. All students communicate appropriately in business, work, and other applied situations.

Science Standards

1. All students explain how scientific principles of chemical, physical and biological phenomena have developed and relate them to real world-situations.
2. All students demonstrate knowledge of basic concepts and principles of physical, chemical, biological and earth sciences.
3. All students use and master materials, tools, and processes of major technologies which are applied in economic and civic life.
4. All students explain the relationships among science, technology and society.
5. All students construct and evaluate scientific and technological systems using models to explain or predict results.
6. All students develop and apply skills of observation, data collection, analysis, pattern recognition, prediction, and scientific reasoning in designing and conducting experiments and solving technological problems.

7. All students evaluate advantages, disadvantages and ethical implications associated with the impact of science and technology on current and future life.
8. All students evaluate the impact of current and future life of the development and use of varied energy form, natural and synthetic materials, and production and processing of food and other agricultural products.
9. All students demonstrate basic computer literacy, including word processing, software applications, and ability to access the global information infrastructure, using current technology.

Dictionary Definitions of Tree Terms

- | | |
|-------------------|--|
| 1. Bark | The woody, outer covering of a tree trunk. It may be smooth or textured. |
| 2. Blade | The flat, wide part of a leaf. |
| 3. Botanist | A scientist who studies plants. |
| 4. Cambium | A thin layer of living, dividing cells just under the bark of trees. |
| 5. Carbon Dioxide | The gas that animals exhale. Trees need to absorb carbon dioxide for photosynthesis. |
| 6. Chlorophyll | The chemical coloring that makes plants look green. It is necessary for photosynthesis. |
| 7. Circumference | In trees, the distance around the trunk. |
| 8. Cone | A woody, rounded structure that contains seeds. A pinecone has many seeds in it. |
| 9. Conifer | Trees that have cones with seeds like pines, spruce, and hemlock. Almost all are evergreen. |
| 10. Deciduous | Trees that lose all of their leaves in the autumn. |
| 11. Evergreen | A tree that has green leaves or needles on it all year long. |
| 12. Leaf | A flat green part that grows in various shapes from the stems or branches of plants and trees and whose main function is photosynthesis |
| 13. Needles | Long, thin leaves, like those of pine. |
| 14. Oxygen | A gas produced by plants during photosynthesis. |
| 15. Palmate | Leaves with several main veins that all start at one point near the base. The veins resemble the palm of the hand with finger extending in different directions. |
| 16. Parallel | Leaves with veins that look like many straight lines all running in the same direction from the base to the tip. |
| 17. Phloem | The plant tissue that transports dissolved nutrients from the leaves to the other parts of the plant. |

18. Photosynthesis	A process by which plants combine water, carbon dioxide, and sun sunlight to make chlorophyll and oxygen.
19. Pinnate	Leaves that have one main vein with many large veins that branch off sideways all along the main vein. The veins look like a feather.
20. Sap	The material transported via the xylem and phloem of a tree.
21. Transpiration	The process by which water evaporates from plant tissues.
22. Tree	A large. Woody plant with a single trunk, growing over 15 feet tall. It usually has many branches and lives for many years.
23. Veins	In plants, the ribs and web-like lines on the blade of a leaf.
24. Xylem	The complex woody tissue of higher plants that includes systems for transporting water, storing nutrients, and structural support.

Tree Products for Research

Wood

Furniture
 Paper products:
 Gift wrap
 Newsprint
 Copy paper
 Cellulose products
 Cellophane
 Cellulose sponges
 Eyeglass frames
 Carpets
 Photography film
 Toothpaste
 Football helmets
 Parmesan cheese
 Rayon clothing
 Rocket fuel

Leaves

Tea
 Oxygen
 Shade

Sap

Maple syrup
 Rubber gloves
 Rubber hoses
 Rubber tires
 Rubber balls
 Rubber bands
 Chewing gum
 Paint
 Turpentine
 Varnish
 Soap
 Rosin
 Asphalt/cement

Bark

Cinnamon
 Cork bulletin boards
 Mulch
 Wax

Fruit

Avocados

Chocolate

Furniture polish

Spices: Allspice, Nutmeg, Mace

Figs

Olives

Roots

Sassafras tea

Almond

Flowers

Cloves

Herbal teas with hibiscus or orange

Blossoms

Perfume

Seeds

Nuts: Pistachio, Macadamia,

Coconuts

