Science Lessons

And worksheets for

Food Forests and Edible Gardens

Be a Chemist: Physical and Chemical Changes Experiment for all Grades

Overall objective: To observe a chemical change by adding an acidic liquid.

Standards and Pacing Guide:

Grade 1 - 1st quarter, SC.1.N.1.1: Practicing of Science
3rd quarter, SC1.L.14.2 Identify Plant Parts

Grade 2 – 2nd quarter, SC2.P.9.1: Investigate How Matter Can Change

Third Grade: 1st quarter, Practice of Science SC3.N.1.1. Question Investigate and Explain

Grade 4- 1st quarter, Practice of Science SC.$.N.1.1: Question Investigate and Explain
2nd quarter, SC.4.P.9.1: Changes in Matter

Grade 5 - 2nd quarter, SC.5.P.9.1: Physical and Chemical Changes

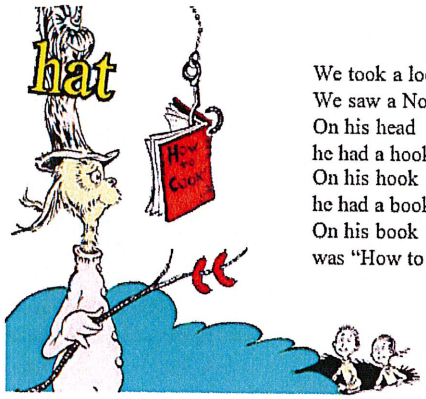
Materials:

- Dried Butterfly Pea flowers which can be found in most school gardens or a bag of dried Butterfly Pea flowers can be ordered from Amazon. See recipe.
- Worksheet for grades 3-5 on chemical changes.

Dr. Seuss Butterfly Juice

—A Chemical Change Science lesson

Serving size: ½ gallon



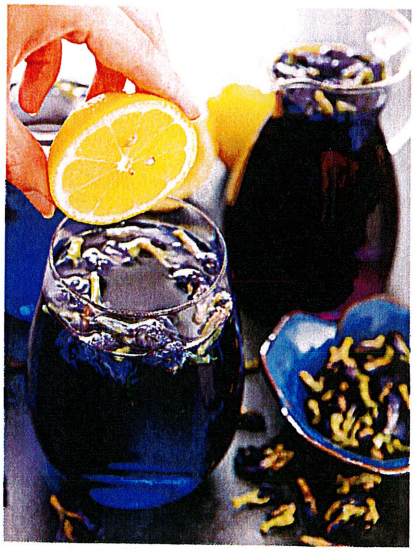
We took a look.
We saw a Nook.
On his head
he had a hook.
On his hook
he had a book.
On his book
was "How to Cook."

INGREDIENTS:

4 cups boiling hot water
6 tsp butterfly pea flowers (fresh or dried)
fresh lemon juice from 1 medium lemon
honey to taste
ice

DIRECTIONS:

1. Add tea to hot water and cover surface to retain heat. Allow tea to seep a few minutes until water turns a deep shade of blue. You can leave the tea leaves in or remove. Stir in lemon juice and add sugar or honey to taste. Serve over ice.



When an acid is introduced to the brewed flower tea, it has a chemical reaction and turns the liquid from blue to purple!

Butterfly pea flower

The Benefits:

* Strengthens the hair for healthy hair growth
* Detoxifies the whole body
* Provides antioxidants
* Slows aging process
* Enhances immune system
* Treats urinary problems
* Stimulates blood circulation
* Prevents skin bruising
* Improves eyesight & night vision
* Keeps skin glowing & healthy
* Treats eye infections

Learning about the Compost Pile

Though this unit is originally for Third Grade, it can easily be modified for grades 2-5.

Grade 2- The Practice of Science: SC.2.N.1.1, SC.2.N.1.2, SC.2.N.1.3, SC.2.N.1.5.
2nd quarter, Investigate how matter can change – SC.2.P.9.1

Grade 3- The Practice of Science: SC.3.N.1.1, SC.3.N.1.2, SC.3.N.1.3, SC.3.N.1.6.
2nd quarter, Energy's ability to cause motion and create changeSC.3.P.10.2

Grade 4 - The Practice of Science: SC.4.N.1.1, SC.4.N.1.2, SC.4.N.1.3, SC.4.N.1.4.
2nd quarter, Forms of Energy: SC.4.P.10.1

Grade 5 - The Practice of Science: SC.5.N.1.1, SC.5.N.1.2,
2nd quarter, Forms of Energy: SC.5.P.10.1

Overview: Students will learn that composting is a way to recycle materials from plants.

Objectives:

Lesson #1: Students will sort and identify items to be composted

Lesson#3: Students will utilize a card game to recognize the ingredients necessary to successfully make compost.

Upper grade modifications: Add vocabulary. Students should also understand the value of nitrogen and carbon, and why energy is released.

Lesson #6: Students will build a mini compost and landfill then compare and contrast the ingredients and the success of each.

Teacher Resources:

- Background and Vocabulary,
- What is a Compost
- Sources of Carbon/Nitrogen Ratio.

Resources:

Wake County Environmental Services, Solid Waste Management Division, Raleigh, NC
Sydney Park Brown, Extension Agent, Environmental Horticulture Seffner, FL

Background Information and Vocabulary

Vocabulary:

Aerobic-a biochemical process or condition occurring in the presence of oxygen.

C/N ratio – Carbon-to-Nitrogen Ratio. The proportion of carbon to nitrogen affects how quickly microorganisms work. The optimum ratio is 30-1. See reference sheet.)

Compost – organic matter that is undergoing or has resulted from decomposition.

Decomposition – the process by which organic materials are broken down into component chemicals.

Microorganisms – small living organism that digest organic material

Organic – Material that is or was living. Contains carbon

Process:

Given the proper environmental conditions-moisture, available oxygen, and a favorable nitrogen/carbon ratio, bacteria will begin to regenerate. They reproduce by cell division. Soon two become four, then eight, sixteen and so on.

Nitrogen provides bacteria with elements of protein to build their bodies.

Carbon is the energy source for the bacteria.

A moisture content of 40%-60% is ideal. If it is less than 40%, the bacteria are forced to slow down and grow dormant. With moisture content over 60%, the pile loses too much air and will begin to smell like rotten eggs.

As the bacteria eat the organic material, chemical changes occur and heat energy is released.

The bacteria will also become a food source for many other insects.

Does your school have a compost pile? If you have a banana circle, the compost pile is in the center. Building or purchasing a compost bin will be of great benefit to your school garden.

What is Compost?

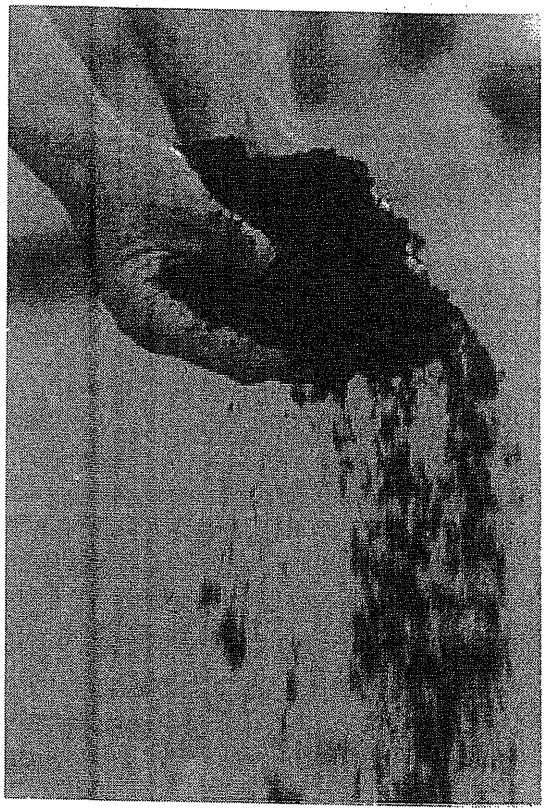
Improving soil by using compost is a keystone of organic gardening. Well-made compost is an incredibly useful material. It is a wonderful soil improver, aiding water retention in light sandy soils and breaking up heavy clay soil. As a growing medium it provides nutrients to plants, allowing for vigorous growth and higher yields. When used as mulch it feeds the plant and improves soil. The composting process has many learning opportunities that are accessible to pupils of all ages.

Compost is a mixture of organic matter that has broken down naturally over time. Good quality finished compost has a dark brown almost black colour. It has a rich, almost sweet, earthy smell. Once passed through a sieve there should be no trace of the component parts, e.g. vegetable peelings, egg boxes etc.

As the organic matter breaks down, a myriad of bacteria, other micro-organisms and mini beasts come together creating a complex ecosystem. It is the management and maintenance of this ecosystem that is vital in creating good quality compost.

Why is compost seen as a keystone in organic gardening?

Successful growing relies upon many factors and arguably the most important factors are the quality of soil and availability of nutrients. If soil is of poor quality with little nutrients, plant growth will be stunted and sickly, yields will be poor and diseases may be an issue. Regular use of compost solves many of these problems.



- Compost is rich in nitrogen (N), phosphorus (P) and potassium (K). Using compost as a mulch or digging it into soil adds these vital nutrients that are needed for vigorous growth and improving crop yields.
- Compost is a first class soil improver, so much so that it is the default solution for many soil problems. Adding organic matter to soil improves drainage in heavy clay soil, aids water retention in light soils and improves aeration, thus reducing soil compaction. Adding compost also encourages creatures such as earthworms which further improve soil quality.
- Compost makes fantastic mulch, locking moisture in the soil, adding valuable nutrients to the soil and improving soil structure as earthworms incorporate it into the soil.

Lesson 1: What Can We Compost?

Grade Level:
3rd Grade

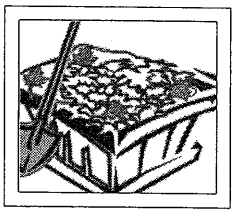
Concepts Taught:
Sorting, identification

Essential Questions:
- What is compost made of?
- What types of items can go into a compost pile?

NC CORE/Essential Standards:
ELA: Text Types and Purposes:
2a,2b,2c,2d
Math 3.NBT.1

Materials:
Copies of the worksheet "What Can We Compost" for each student or use one transparency

Objectives:
- Students will sort and identify items that can be composted.



Procedure:
1. Review the teacher background section on compost.
2. Have each student name one thing they throw away each day and write each item on half of the board.
3. Explain to students that not all the items must go into the trashcan. Some can be recycled, reused, or composted.
4. Explain to students that composting is a way to **recycle organic** (plant or animal) material. Items that can be composted include food waste such as orange peels, banana peels, potato peelings, bread crusts, eggshells, coffee grounds, and other non-food items such as shredded newspaper, teabags, leaves, grass, and sticks.
4. On the other half of the board, make four column headings: recycle, reuse, compost, and trash. Go back through the list of brainstormed trash items and have the students name where each item should go.

Recycle	Reuse	Compost	Trash

Key:
Can be Composted: Leaves, branches, banana peel, vegetables, grass, hay, sticks, apple core
Cannot be composted:
Oil, can, boots, books, cheese, bones, turkey, paint

NOTE: animal products such as cheese, bones, and turkey should only be composted in large-scale or commercial-type composting processes, not in classroom or residential compost bins

Extensions/Modifications:
1. Using the worksheet below, have students identify which items can be composted and which cannot.

2. Using old magazines or catalogs have students create a collage showing items that can be composted.

Lesson 1 NAME_____

What can we compost?

Make an X on things that do not go in a compost pile.
Circle the things that can go in a compost pile.


leaves


oil


branches

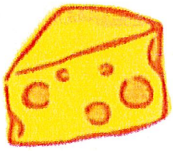

banana peel

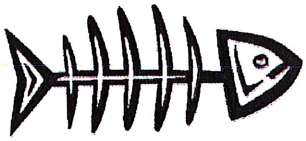

can


vegetables

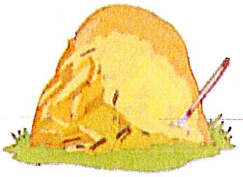

boots


books

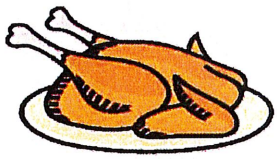

cheese

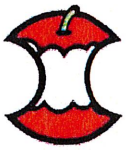

bones


grass


hay


sticks


turkey


apple core


paint