

TEACHER MATERIALS - Plant Power (seeds)

CONCEPTS:

- Math, Science, and Technology
 - Standard 4.4- Physical Setting
 - Standard 4.1, 4.4, 4.6- Living Environment
- Career Development
 - Standard 3a.1- Basic Skills

- OBJECTIVES:**
1. The students will understand that plants store energy and that one way plants store energy is in their seeds.
 2. The students will understand that seeds absorb water before they germinate.
 3. The students will understand that as seeds absorb water they swell.
 4. The students will understand that plants can have enormous power (relative to size) due to their storage of light energy. (Plants store energy by converting it to sugar, starches, fats, and producing protein.)

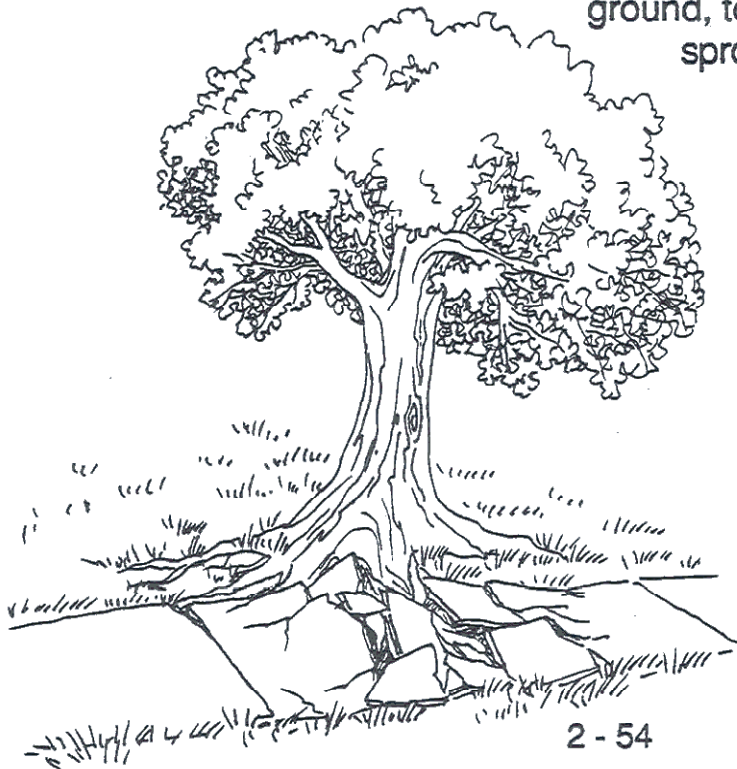
BACKGROUND: Plants take energy from the sun and store it, produce food, give off oxygen, grow, and reproduce. Plants store energy by absorbing sunlight and converting it to proteins, carbohydrates, and oils through the process of photosynthesis. Different plants produce differing amounts of each. Trees, for example, produce cellulose and lignins for tree trunks; sugars such as that used to make maple syrup or in apples; oils in nuts, such as walnuts; or complex carbohydrates, such as the meat of an acorn. One way that plants store energy is in their seeds. As a seed begins the process of germination, it absorbs water. The cells awaken and expand. This expansion will result in greater volume than the original

seed and water. In the growth process, plants can have enormous power. Seeds have great power because most contain oils or fats as well as carbohydrates. Oils have more than twice the energy of carbohydrates. Tree roots can lift and break concrete sidewalks. This is easily seen wherever mature trees grow next to an old sidewalk. Trees growing in inhospitable places can be seen cracking boulders. Even the crowded roots of a house plant can break their clay pot.

This activity shows very clearly that plants store energy in their seeds in a very simple way. The expansion of the seed as it begins to grow has the ability to move objects - pushing soil out of the way to reach the sun, moving pebbles, etc. Seeds have incredible energy potential just as trees do.

ACTIVITIES:

1. Discuss with the students that plants take in energy from the sun (light) and make food. This food is stored in many ways. One of the ways is to produce seed and hold the stored energy for the next generation of plants. Seeds contain stored energy. This stored energy allows the seed, buried in the ground, to grow large enough (as a sprout) to reach the sun and begin to produce its own food.



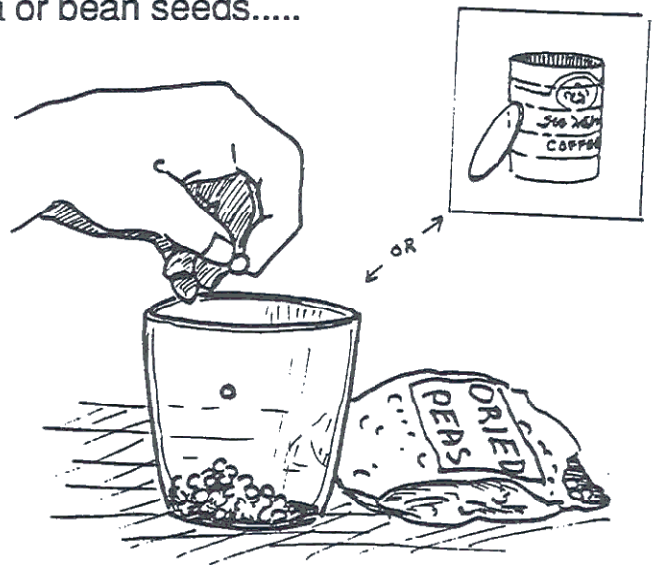
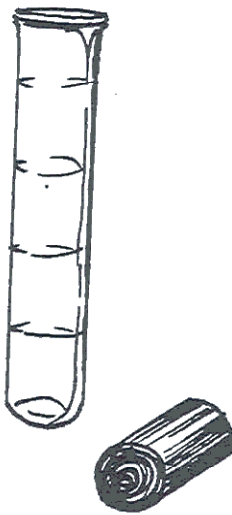
2. Ask the students if they have ever seen a tree that has lifted and broken a sidewalk. trees growing in rocks and splitting them apart. How does this happen? Trees have the power to lift and crack sidewalks because of the storage

of sunlight by converting it to plant sugars, fats, oils, carbohydrates, and proteins and utilizing the energy to grow. While this takes place slowly, it does, indeed, take place. (Water and freezing help in this action.)

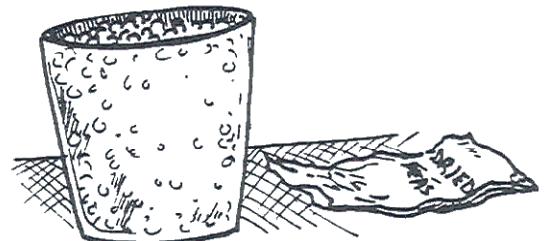
How do we use this stored energy? We use wood for fuel, furniture, paper, rayon, ink, turpentine, and a hundred other uses. We use seeds, leaves, stems, and root structures for foods of all types, oils, beverages, pharmaceuticals, animal feed, etc.

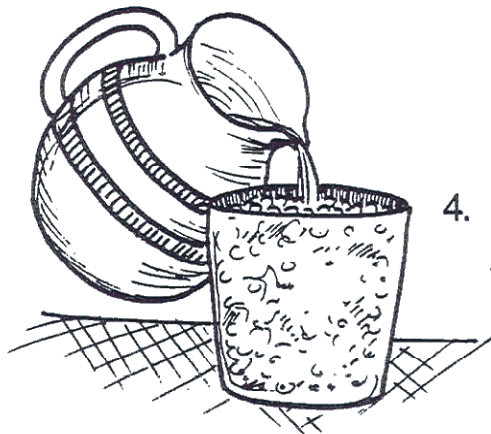
Do the children know that oil and coal are this same plant energy? When the earth was a tropical swamp, many of the trees and plants grew, died, and decomposed into peat, layer upon layer. Time and pressure created seams of coal or subterranean pools of oil.

3. In the very beginning of the school day, fill a container (coffee can, jelly jar, anything with a snap-on plastic lid or a test tube with a cork or rubber stopper) with whole dried pea or bean seeds.....



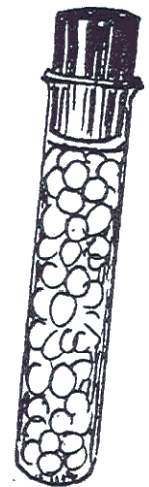
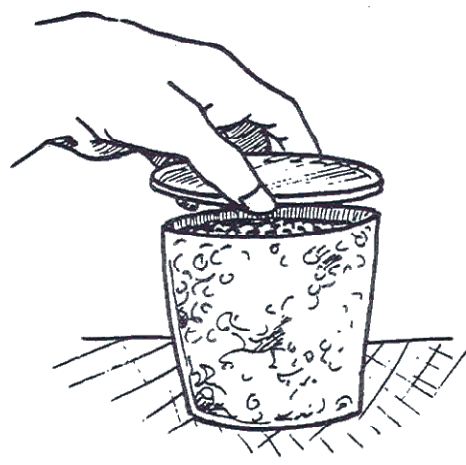
just to the very top.





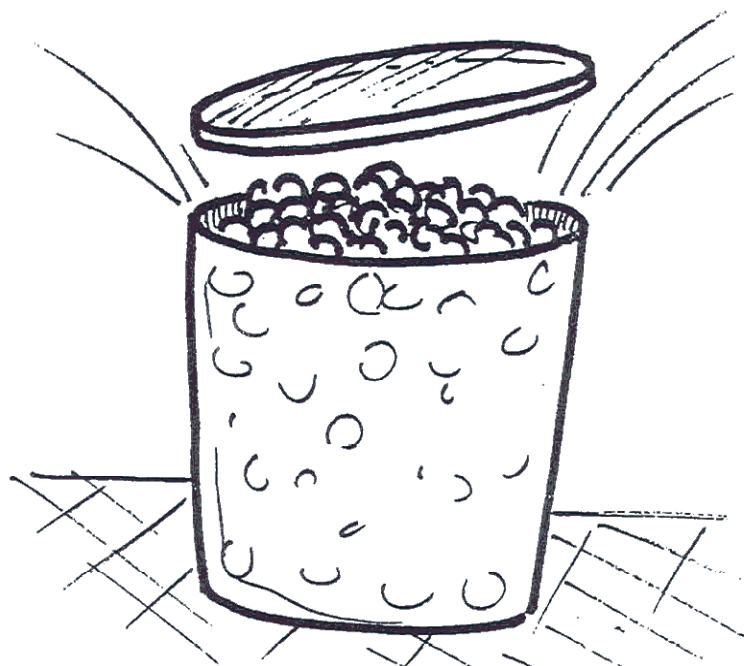
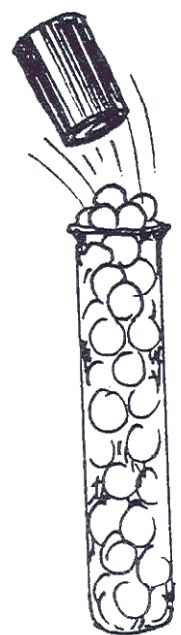
4. Fill the container with water, again just to the top.

5a. Snap on the plastic lid, cork, or stopper.



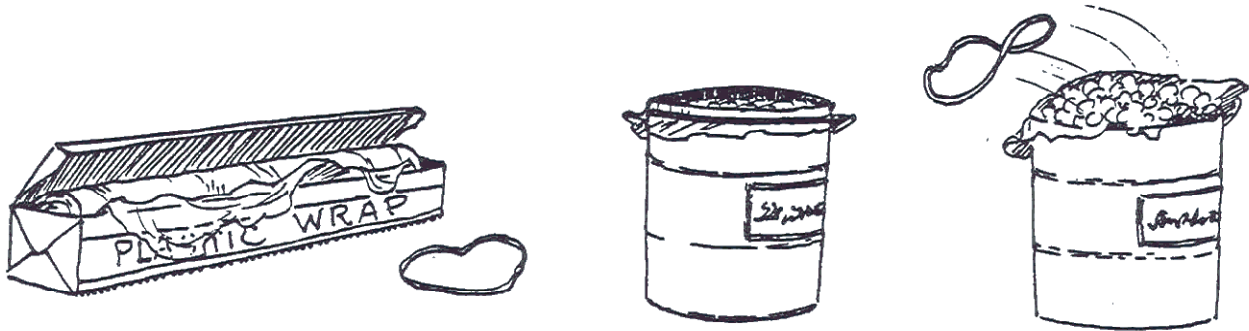
b. Wait six or eight hours.

c. The swelling seeds will pop off the top.



6. Although somewhat less dramatic, this may also be

done with any container. Stretch plastic wrap over the top and secure it with a rubberband. Make sure the rubberband is very close to the top of the container.



7. Ask the students why this occurred. It took energy to make the lid pop off.

Where did this energy come from? The seeds absorb water and begin to expand. Energy stored in the seeds allows the seeds to grow. This expansion is the energy which forced off the top of this container.

Why are the growing seeds larger than the dried seeds and water? Inside the seeds the cells are absorbing water and growing larger. This may be a good time to discuss that all plants and animals are made up of cells.

8. Follow this up by planting the swollen seeds in a school garden. This may be done late in the spring. The seeds should be planted 1 1/2 inches deep in the soil in a row that can be staked.

