



KINDERGARTEN

Observing, Comparing and Contrasting

Kindergarten Science Content Standards: Physical Sciences

Properties of materials can be observed, measured, and predicted.

1. A. Students know objects can be described in terms of the materials they are made of and their physical properties (color, size, shape, attraction to magnets, floating, and sinking).
- B. Students know water can be a liquid or a solid and can be made to change back and forth from one form to the other.

The following lessons and background information will focus on observing, measuring, predicting, and testing different properties of materials.

Teachers: Floating and Sinking ~ Density of Water

The density of water is the weight of water divided by the amount of space it occupies. Water density is primarily determined by both the temperature of water, as well as the salt content of water, known as its salinity. Unlike other substances that tend to be most dense while it is in the solid form, water is actually less dense when it freezes into its' solid state (ice). Water becomes most dense at approximately 39.2 degrees F just before it reaches its freezing point of 32 degrees F.

The reason for this is that as water begins to reach 39.2 degree's F, the molecules move closer together, which increases the water's density. As water gets colder than 39.2 degrees F, the molecules then start to move apart from each other to form a rigid crystalline structure, providing an air space in the middle of this structure, making the frozen water lighter weight and therefore less dense.

Activity: Why Ice Floats & The Three Forms of Water

To explain further about the three forms of water or why ice floats, call 6 students to the front of the class. Each of these students is going to represent a very small bit of water, called a molecule (H₂O). Direct the students to the front of the room forming a small cluster of six children.

Pretend that the temperature drops (using a thermometer as a model if possible) to the freezing point of water (0 degrees Centigrade; 32 degrees Fahrenheit) and have the children behave like the water molecules do. Explain that when water molecules freeze, they move slowly and into a structured pattern like a circle with a big space in the middle ~ have the children demonstrate this by each holding hands with one another and spreading out, then “freeze” into this position. This is why water in the form of ice expands instead of contracting like most liquids. Also, the air space produced in the middle of the structure causes the ice to be lighter in weight, in other words: less dense, so the ice floats. Ask the students: “What is water called when it becomes solid?”
Answer: Ice, frozen, or any other appropriate response, such as snow.

Then pretend to raise the temperature. Direct the students to release hands and march in a cluster across the front of the room. Explain that as the water heats up, the molecules start to move apart, but still follow a pattern that would flow downward if possible. This explains how liquid water flows. (Notice that the molecules do not get larger, there is just more movement.)

Now pretend to raise the temperature to the boiling point of water (100 degrees Centigrade; 212 degrees Fahrenheit) and have the students all go quickly back to their seats. Explain that once the water gets hot enough, the molecules move faster and faster and farther and farther apart until they are scattered everywhere. This explains how water evaporates into the air.

Teachers: Floating and Sinking ~ Salty Water

Cold salt water, such as seawater, is much more dense than warm, fresh water because of the difference in temperature, as well as the higher salt content in the water. The more minerals or materials in the water, the denser the water is in general. The deepest parts of the ocean contain the densest water.

Activity: Which Liquids Are Less Dense and Will Float on Top of Other Liquids?

Materials:

- clear drinking straws
- clay
- salt
- blue, red, and yellow food coloring
- 3 clear plastic, 10 oz. cups filled with water
- eye droppers
- measuring spoons

Procedure:

1. Add a few drops of blue food coloring to one of the cups filled with water. Add red to the second cup, and yellow to the third cup.
2. Next measure, then add a different amount of salt to each cup. Add 3 tablespoons of salt to one cup, a ½ teaspoon to the second cup, and a pinch of salt to the third cup. Stir each to dissolve the salt.

3. Make a base for the drinking straw using the clay, so that the straw will stand upright.
4. Explain that you are going to add each of the different colors of water to the straw and have the students predict which color of water will settle to the bottom of the straw and which will float on the top. Remind the students that the water with more salt is the densest.
5. Using the eye droppers, drop the different colors of water into the straw and observe what happens.

Conclusion:

The different colors of water will float on top of each other because of their varying densities. The color with the most salt is the densest and will be at the bottom. The color with the least salt is the least dense and will float at the top.

Teachers: Attraction to Magnets

Magnetism is a force of attraction or repulsion of materials that most commonly include iron and steel. A magnetic field created around the magnet is caused by the movement of charged particles making it possible for magnets to attract other magnets with similar properties as it's own. The poles on a magnet, referred to as the north and south poles, are the points at which the magnetic strength is most powerful.

It is important to remember that dissimilar poles attract each other and similar poles repel each other. This means that the north pole of one magnet would attract the south pole of another magnet ~ and that the north pole of a magnet would repel another north pole.

An interesting property of magnets is the ability to replace its poles once a magnet is broken. Whenever a magnet is broken in half or in many pieces, a north pole can be found at one end, while a south pole can be found at the other end. This enables each piece to have both a north and south pole no matter how many times it is broken, or how small the pieces are.

It is important to remember that the attraction and repulsion force of two magnets depends on how close the magnets are to one another and also how strong the magnetic force is between the two. The closer they are, the stronger the attraction or repulsion will be.

Activity: Magnetism

Materials:

- ❑ One magnet per team of students
- ❑ Green paper; red paper
- ❑ Baggie of objects per team of students (Objects can include: household items, such as metal spoons, coins, soda cans, napkins, glass jar, and plastic cup....and classroom items, such as pencils, chalk, crayons, paper clips, and

rubber bands. ~ *These items could also be used for a floating and sinking experiment.*)

Preparation and Procedure:

1. Have the students predict whether each object will be attracted to the magnet or not. Hand out the baggie of objects first (do not include the magnet). Give each team of students a green piece and a red piece of paper. Mention that the objects that they think will stick to the magnet should be placed on the green paper; other objects that they think will not stick to the magnet should be placed on the red paper.
2. Have the students pull out each object you describe one at a time. As they hold each object, for example the metal spoon, have them predict whether the magnet will stick to it. If they think it will, have them place it on the green paper (if they think it won't stick, have them place it on the red.) Repeat this activity for each of the objects.
3. Once all of the objects are sorted, distribute the magnets and have them test the objects on the green paper. Have them transfer any object that did not stick to the magnet to the red paper.
4. Then have the students test all of the objects on the red paper. If any of those objects stick to the magnet, they should transfer it to the green paper. By the end of this activity, all of the magnetic objects should be on the green paper.

Kindergarten Science Content Standards: Life Sciences

Different types of plants and animals inhabit the earth.

2. A. Students know how to observe and describe similarities and differences in the appearance and behavior of plants and animals.

- C. Students know how to identify major structures of common plants and animals.

Teachers: Parts of Plants

All plants have six basic parts: Roots, Stem, Leaves, Flower, Fruit, and Seeds.

Root: Roots anchor plants into the ground, and also absorb nutrients from the soil to feed the plant. All plants have either a taproot system (ex. carrots), or a fibrous root system (ex. grass). In either case, roots provide both water and nutrients to plants, which are basic materials used for photosynthesis (the manufacture of food utilizing sunlight) and plant metabolism.

Stem: Stems carry the water and nutrients obtained by the roots up to the leaves of the plant. Stems are also important to give plants the support they need in order for leaves to stand upright and obtain the maximum amount of sunlight possible.

Leaves: Leaves are responsible for the production of food in green plants through photosynthesis. In this process, the Sun's energy is used to produce sugar (glucose) which provides the plants with nutrients in a usable form. Oxygen is also produced as a by-product of photosynthesis. Oxygen is used by people and many other life forms to breathe.

Flowers: Flowers are important for the production of seeds in plants. The petals of the flower are important in attracting pollinators, such as bees and butterflies. Small structures, called sepals, at the base of the flower are used to protect a developing bud.

Fruit: Fruits are the ripened ovary of a plant which we are often able to eat. Once fertilized, the ovary swells and becomes either fleshy or hard in order to protect the seeds contained inside. Those things we call vegetables are actually also fruits (examples: tomatoes, cucumber, and beans) since the word "fruit" is a botanical term for developed ovaries.

All plants, including those grown indoors, need seven essential things in order to grow. They are: (1) Room to grow, (2) Time, (3) Water, (4) Appropriate temperature, (5) Light, (6) Air, and (7) Nutrients.

Room To Grow: It is important for parts of the plants that are above ground to have adequate room so that leaves obtain enough sunlight in order to carry out the food producing process of photosynthesis. Below the ground, roots also need plenty of space to ensure they are not crowded; crowded roots can cause lower rates of growth.

Time: Most plants grow at different rates, making the amount of days or months it takes for plants to grow, flower, and seed vary from one plant to another.

Water: Water is important to a plant because it contributes to both making and moving nutrients throughout the plant. How much water a plant needs depends on various things, such as the size of a plant, the type of plant, and the time of year. It is also important to remember that because water is so essential to the health of a plant, most plants will die without a proper water supply.

Appropriate Temperature: Different plants require different temperatures for their best growth. Some plants prefer cooler temperatures, and some prefer a slightly warmer climate. Because of this and the amount of light a plant needs, some plants grow more optimally during particular seasons.

Light: In order to carry out photosynthesis, plants need to be exposed to a generous amount of bright light. Some plants grow better in direct light; others in shade.

Air: Plants use carbon dioxide during the process of photosynthesis and in turn release oxygen into the air. Smoke and other air pollution can damage plants and even cause them to die.

Nutrients: The three most important nutrients for plants are nitrogen, phosphorous, and potassium.

- Nitrogen – Nitrogen is what gives plants their dark green color and is important for above-ground growth.
- Phosphorous – Phosphorous aids in the division of plant cells, the production of flowers and seeds, and the development of a strong root system.
- Potassium – Potassium aids plants in fighting off diseases and also contributes to the development of strong stems.

Most nutrients a plant needs are dissolved in water, then transported into a plant through its root system.

Activity: Growing Plants

Soaked lima beans can be carefully broken open to display parts of the seed. Parts of the seed are easily observed with the unaided eye or a magnifying lens. The young plant is dormant until the conditions are optimal for the plant to grow. With most seeds, introducing water into their environment is enough of a stimulus to bring the seed out of dormancy. With some of our native seeds, the seed coat must be scarred or even burned to produce the same affect.

Purpose of the seed's parts:

- 1) Seed coat: Protects the seed; keeps the young plant from growing until the conditions are optimal.
- 2) Cotyledon: Provides food for the baby plant; main part of the seed itself.

- 3) Epicotyl: Looks like small leaves; forms the leaves of the plant.
- 4) Hypocotyl: Forms the stem of the plant.
- 5) Radicle: Forms the roots of the plant.

While the names of the seed parts may be too advanced for the students, one can still look at the seed parts to explore how seeds contain a “baby” plant.

Plant seeds or bulbs so the students can observe their growth. As the plants are growing, have the students draw their progress in sequence. An experiment can be performed using different types of soil; make sure the amount of water is measured in order to have the difference in soil be the only variable in the experiment.

WEBSITES

Use these sites to get ideas for activities and for teacher resources on gardening.

<http://kidsgardening.com>

<http://aggie-horticulture.tamu.edu>

<http://arboretum.fullerton.edu>